M. C. E. Society's
AbedaInamdar Senior College
Of Arts, Science and Commerce, Camp, Pune-1
(Autonomous) Affiliated to SavitribaiPhule Pune University
NAAC accredited 'A' Grade

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

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.

Outcomes:

- An ability to apply knowledge of computing and mathematics appropriate to the discipline.

- An ability to identify, formulates, and develop solutions to computational challenges.

- An ability to design, implements, and evaluate a computational system to meet desired needs within realistic constraints.

- An ability to function effectively on teams to accomplish shared computing design, evaluation, or implementation goals.

- An understanding of professional, ethical, legal, security, and social issues and responsibilities for the computing profession.

- An ability to communicate and engage effectively with diverse stakeholders.

- An ability to analyze impacts of computing on individuals, organizations, and society.

- Recognition of the need for and ability to engage in continuing professional development.

- An ability to use appropriate techniques, skills, and tools necessary for computing practice.

- An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computational systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

- An ability to apply design and development principles in the construction of software systems of varying complexity.

Structure of F.Y.B.Sc(CS)

Semester-I   **Total Credit-22**

Sr.No	Name of the Course/Paper Title
1	Problem Solving Using Computer and 'C' Programming –I
2	Database Management System
3	PracticalcourseonProblemSolvingusingComputerand 'C'programming and DatabaseManagementSystems
4	Mathematics – I, II and III
5	Electronics-I ,II and III
6	Statistics – I, II and III

Semester-II   **Total Credit-22**

Sr.No	Name of the Course/Paper Title
1	Advance 'C' Programming
2	RelationalDatabaseManagementSystems
3	Practical course based on Advance C Programming and RDBMS
4	Mathematics – I, II and III
5	Electronics-I ,II and III
6	Statistics – I, II and III

Syllabus for F.Y.B. Sc. (Computer Science)
2021-22 (CBCS – Autonomy 21 Pattern)

Course/ Paper Title	Problem Solving Using Computer and 'C' Programming - I
Course Code	21SBCS111C
Semester	I
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To introduce the foundations of computing, programming and problem- solving using computers.
2.	To develop the ability to analyze a problem and devise an algorithm to solve it.
3.	To understand structured programming approaches.
4.	To develop the basic concepts and terminology of programming in general.
5.	To implement algorithms in the 'C' language.
6.	To test, debug and execute programs.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	Explore algorithmic approaches to problem solving.
2.	Develop modular programs using control structures and arrays in 'C'.

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit -I	**Problem Solving Aspects**	**6**
	1. Introduction to problem solving using computers. 2. Problem solving steps. 3. Algorithms-definition, characteristics, examples, advantages and limitations. 4. Flowcharts - definition, notations, examples, advantages and limitations, Comparison with algorithms. 5. Compilation process(compilers, interpreters),linking and loading, syntax and semantic errors, testing a program	
Unit-II	**'C' Fundamentals**	**9**
	1. History of 'C' Language 2. Application areas. 3. Structure of a 'C' program. 4. 'C' Program development life cycle. 5. Function as building blocks. 6. 'C' tokens 7. Character set, Keywords , Identifiers 8. Variables, Constants (character, integer, float, string, escape sequences, enumeration constant). 9. Data Types (Built-in and user defined data types). 10. Operators, Expressions, types of operators, Operator precedence and Order of evaluation. 11. Character input and output. 12. String input and output.	

	13. Formatted input and output.	
	14. Introduction to preprocessor	
Unit-III	**Control Structures**	**7**
	1. Decision making structures:-if, if-else, switch and conditional operator.	
	2. Loop control structures:-while, do while, for.	
	3. Use of break and continue.	
	4. Nested structures.	
	5. Unconditional branching (goto statement).	
Unit IV	**Functions**	**7**
	1. Concept of function, Advantages of Modular design.	
	2. Standard library functions.	
	3. User defined functions:-declaration, definition, function call, parameter passing (by value), return statement.	
	4. Recursive functions.	
	5. Scope of variables and Storage classes.	
Unit V	**Arrays**	**7**
	1. Concept of array.	
	2. Types of Arrays – One, Two and Multi-dimensional	
	3. Array.	
	4. Array Operations - declaration, initialization, accessing array elements.	
	5. Memory representation of two-dimensional array (row major and column major)	
	6. Passing arrays to function.	
	7. Array applications	

References:

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, McGrawHill

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

6. Programming in C ,A Practical Approach, Ajay Mittal ,Pearson

7. Programming with C, B. Gottfried, 3rd edition, Schaum's outline Series, Tata McGraw Hill.

8. Programming in ANSI C, E. Balagurusamy, 7thEdition, McGrawHill.

Course/ Paper Title	Database Management Systems
Course Code	21SBCS112C
Semester	I
No. of Credits	2 (36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1	To understand the fundamental concepts of databases.
2	To understand user requirements and frame it in a data model.
3	To understand creations, manipulation and querying of data in databases.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1	Solve real world problems using appropriate set, function, and relational models.
2	Design E-R Model for given requirements and convert the same into database tables.
3	Use SQL.

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	**Introduction to DBMS**	4
	1. Introduction 2. File system Vs. DBMS 3. Data independence 4. Structure of DBMS	

	5. Users of DBMS Advantages of DBMS	
Unit II	**Conceptual Design**	**12**
	1. Overview of DB design process 2. Introduction to data models (E-R model, Relational model, Network model, Hierarchical model) 3. Conceptual design using ER data model (entities, attributes, entity sets, relations, relationship sets) 4. Constraints (Key constraints, Integrity constraints, referential integrity, unique constraint, Null/Not Null constraint, Check constraint, Mapping constraints) Extended features – Specialization, Aggregation, Generalization	
Unit III	**SQL**	**12**
	1. Introduction to query languages 2. Basic structure 3. SQL Commands 4. Basic SQL query with constraints & nested queries 5. Aggregate Operators and functions 6 SQL mechanisms for joining relations (inner joins, outer joins and their types) 7 Views	
Unit IV	**Relational Database Design**	**8**
	1.Introduction to Relational-Database Design (undesirable properties of a RDB design) 2. Functional Dependency(Basic concepts, F+,	

| | Closure of an Attribute set)

3. Concept of normalization, Normal Forms (1NF,2NF and 3NF),Examples

4 Keys Concept | |

References:

1. Database System Concepts, Henry F. Korth, Abraham Silberschatz, S.Sudarshan,ISBN:9780071289597,Tata McGraw-Hill Education

2. Database Management Systems,RaghuRamakrishnan,ISBN:9780071254342,Mcgraw-hill higher Education

3. Database Management Systems, Raghu Rama Krishnan and Johannes Gehrke, McGraw-Hill Science/Engineering/Math; 3 edition, ISBN:9780072465631

4. Database Systems, Shamkant B. Navathe,RamezElmasri,ISBN:9780132144988,PEARSON HIGHER EDUCATION

Course/ Paper Title	Practical course on Problem Solving using Computer and 'C' programming and Database Management Systems
Course Code	21SBCS113C
Semester	I
No. of Credits	1.5 (46.8 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1	To understand the program development life cycle.
2	Solve simple computational problems using modular design and basic features of the 'C' language.
3	Understand basic database management operations.
4	Design E-R Model for given requirements and convert the same into database tables

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1	Devise pseudo codes and flowchart for computational problems.
2	Write, debug and execute simple programs in 'C'.
3	Create database tables in postgreSQL.

Syllabus

Unit No.	Title with Contents	No. of Session
Unit I	**Problem Solving Using Computer and 'C' Programming - I**	**06**
	Assignment 1. Problem Solving using Pseudo code and Flowchart, Simple programs, Understanding errors and error handling. **Assignment 2.** Decision Making Control Structures. **Assignment 3.** Loop Control Structures **Assignment 4.** Functions (User Defined functions, Library functions and Recursion). **Assignment 5.** Arrays (1-D and 2-D).	
Unit II	**Database Management Systems**	**06**
	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.** 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

Assignment 4.

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 5.

To query the tables using simple form of select statement Select <field-list> from table [where <condition> order by <field list>] Select <field-list, aggregate functions > from table [where <condition> group by <> having <> order by <>]

Assignment 6.

To query table, using set operations (union, intersect)

Assignment 7.

To query tables using nested queries (use of 'Except', exists, not exists, all clauses

Assignment 8.

To create views.

Operating Environment:

Sr.No	Operating Environment
1	For 'C' Programming : Operating system: Linux Editor: Any Linux based editor like vi, gedit etc. Compiler : cc or gcc
2	**For DBMS:** Operating System: Linux Operating system DBMS: PostgreSQL Language: SQL

Course/ Paper Title	Advanced 'C' Programming
Course Code	21SBCS121C
Semester	II
No. of Credits	2(36 lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To study advanced concepts of programming using the 'C' language.
2.	To understand code organization with complex data types and structures.
3.	To work with files.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1.	Develop modular programs using control structures, pointers, arrays, strings and structures
2.	Design and develop solutions to real world problems using C.

Syllabus

Unit No.	Title with Contents	No. of Lectures
Unit I	**Pointers**	10
	1. Introduction to Pointers. 2. Declaration, definition, initialization, dereferencing. 3. Pointer arithmetic. 4. Relationship between Arrays & Pointers- Pointer to array, Array of pointers. 5. Multiple indirections (pointer to pointer).Functions and pointers- Passing pointer to function, returning pointer from function, function pointer. 6. Dynamic memory management- Allocation(malloc(), calloc()),Resizing(realloc()), Releasing(free())., 7. Memory leak, dangling pointers. 8. Types of pointers.	
Unit II	**Strings**	9
	1. String Literals, string variables, declaration, definition, initialization. 2. Syntax and use of predefined string functions 3. Array of strings. Strings and Pointers 4. Command line arguments.	
Unit III	**Structures And Unions.**	10
	1. Concept of structure, definition and initialization, use of typedef. 2. Accessing structure members. 3. Nested Structures	

	4. Arrays of Structures		
	5. Structures and functions- Passing each member of structure as a separate argument, passing structure by value /address. Pointers and structures.		
	6. Concept of Union, declaration, definition, accessing union members.		
	7. Difference between structures and union		
Unit IV	**File Handling**	**7**	
	1. Introduction to streams.		
	2. Types of files .Operations on text files.		
	3. Standard library input/output functions.		
	4. Random access to files.		

References:

1. C: the Complete Reference, Schildt Herbert, 4th edition, McGrawHill

2. A Structured Programming Approach Using C, Behrouz A. Forouzan,Richard F. Gilberg, Cengage Learning India

3. The 'C' programming language, Brian Kernighan, Dennis Ritchie,PHI

4. Programming in C ,A Practical Approach, Ajay Mittal ,Pearson

5. Programming with C, B. Gottfried, 3rd edition, Schaum's outline Series, Tata McGraw Hill.

6. Programming in ANSI C, E. Balagurusamy, 7thEdition, McGrawHill.

Course/ Paper Title	Relational Database Management Systems
Course Code	21SBCS122C
Semester	II
No. of Credits	2(36 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1.	To teach fundamental concepts of RDBMS(PL/ PgSQL)
2.	To teach database management operations
3.	Be familiar with the basic issues of transaction processing and concurrency control
4.	To teach data security and its importance

Expected Course Specific Learning Outcome

Sr. No.	Learning Outcome
1.	To design E-R Model for given requirements and convert the same into database tables.
2.	To use database techniques such as SQL & PL/SQL.
3.	To explain transaction Management in relational database System.

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	**Relational Database Design Using PLSQL**	10
	1. Introduction to PLSQL 2. Stored Procedures 3. Stored Functions 4. Handling Errors and Exceptions 5. Cursors 6. Triggers	
Unit II	**Transaction Concepts and concurrency control**	12

	1. Introduction and basic concepts of transaction	
	2. Schedules & concept of Serializability	
	3. Serializability by lock mechanism	
	4. Basic timestamp method & Thomas Write Rule.	
	5. Locks with multiple granularity, dynamic database concurrency (Phantom Problem), Timestamp V/s Locking	
	6. Deadlock	
Unit III	**Database Integrity and Security Concepts**	**6**
	1. Domain constraints & Referential Integrity	
	2. Methods for database security	
	i. Discretionary access control method	
	ii. Mandatory access control	
	iii. Role base access control for multilevel security.	
	3. Use of views in security enforcement.	
	4. Encryption technique for security. Statistical database security.	
Unit IV	**Crash Recovery**	**5**
	1. Failure classification	
	2. Recovery concepts	
	3. Log base recovery techniques (Deferred and Immediate update)	
	4. Checkpoints, Relationship between database manager and buffer cache.	
	5. Recovery with concurrent transactions (Rollback, checkpoints, commit)	
	6. Database backup and recovery from catastrophic failure	
Unit V	**Other Databases**	**3**
	1. Introduction to Parallel and distributed Databases	
	2. Introduction to Object Based Databases	

	3. Other Databases (XML ,NoSQL, Multimedia, Big Data)	

References:

1. Database System Concepts, By Silberschatz A., Korth H., Sudarshan S., 6th Edition, McGraw Hill Education
2. Database Management Systems, Raghu Ramakrishnan, Mcgraw-Hill Education
3. Database Systems, Shamkant B. Navathe, RamezElmasri, PEARSON HIGHER EDUCATION
4. Fundamentals of Database Systems, By: Elmasri and Navathe, 4th Edition Practical PostgreSQL O'REILLY
5. Database Management Systems,RaghuRamakrishnan and JohannesGehrke,McGraw-Hill Science/Engineering/Math; 3 edition, ISBN: 9780072465631
6. NoSQL Distilled, Pramod J. Sadalage and Martin Fowler, Addison Wesley
7. An Introduction to Database Systems", C J Date, Addison-Wesley
8. Database Systems : Concepts, Design and Application", S.K.Singh, Pearson, Education
9. NoSQL Distilled A Brief Guide to the Emerging World of Polyglot Persistence : by Pramod J. Sadalage, Martin Fowler, Addison-Wesley, Pearson Education, Inc.
10. MongoDB: The Definitive Guide , Kristina Chodorow, Michael Dirolf, O'Reilly Publications

Course/ Paper Title	Practical course based on Advance C Programming and RDBMS
	CS122C
Course Code	21SBCS123C
Semester	2
No. of Credits	1.5 (46.8 Lectures of 50 minutes)

Aims & Objectives of the Course

Sr. No.	Objectives
1	To solve real world computational problems.
2	To perform operations on relational database management systems.
3	To write, debug and execute programs using advanced features in 'C'.
4	To use SQL & PL/SQL.
5	To perform advanced database operations.

Expected Course Specific Learning Outcomes

Sr. No.	Learning Outcome
1	Devise pseudo codes and flowchart for computational problems.
2	Write, debug and execute simple programs in 'C'.
3	Create database tables in postgreSQL.

Syllabus

Unit No.	Title with Contents	No. of Session
Unit I	**Advanced C Programming**	**06**
	Assignment 1. Simple Pointers. a) Pointer initialization and use of pointers. b) Pointer Arithmetic. **Assignment 2.** Dynamic Memory Allocation. **Assignment 3.** String handling using standard library functions. **Assignment 4.** Structure and Unions. **Assignment 5.** File Handling. **Assignment 6.** C Preprocessors.	
Unit II	**Relational Database Management Systems**	**06**
	Suggested List of Assignments: **Assignment 1. Stored Procedure** 1) A Simple Stored Procedure 2) A Stored Procedure with IN, OUT and IN/OUT parameter **Assignment 2: Stored Function**	

	1) A Simple Stored Function	
	2) A Stored Function that returns	
	3) A Stored Function recursive	
	Assignment 3 : Cursors	
	1) A Simple Cursor	
	2) A Parameterized Cursor	
	Assignment 4 : Exception Handling	
	1) Simple Exception- Raise Debug Level Messages	
	2) Simple Exception- Raise Notice Level Messages	
	3) Simple Exception- Raise Exception Level Messages	
	Assignment 5 : Triggers	
	1) Before Triggers (insert, update, delete)	
	After Triggers (insert, update, delete)	

Operating Environment

Sr.No	Operating Environment
1	For Advanced 'C' Programming : Operating system: Linux Editor: Any Linux based editor like vi, gedit etc. Compiler : cc or gcc
2	**For RDBMS:** Operating System: Linux Operating system DBMS: PostgreSQL Language: SQL