Anekant Education Society's

TuljaramChaturchand College, Baramati

(Autonomous)

Three Year B.Sc. Degree Program in Computer Science

(Faculty of Science & Technology)

CBCS Syllabus (2019 Pattern)

F.Y. B.Sc.(Computer Science) Sem- I

For Department of Computer Science

Tuljaram Chaturchand College of Arts, Science & Commerce, Baramati

Class : F.Y.B.Sc. (Computer Science)			
Semester I		**Semester II**	
CSCO 1101	Basic Programming using C	CSCO 1201	Advanced Programming using C
CSCO1102	DBMS-I	CSCO 1202	DBMS-II
CSCO1103	Lab Course I : Basics of C	CSCO 1203	Lab Course I : Advanced C
CSCO1104	Lab Course II : DBMS I	CSCO1204	Lab Course II : DBMS II
Physical Education			

Class :S.Y.B.Sc. (Computer Science)			
Semester III		**Semester IV**	
CSCO 2301	Data Structures using C	CSCO2401	Object Oriented Concepts using Java
CSCO2302	Introduction to Web Technology	CSCO2402	Software Engineering
CSCO2303	Lab Course I : Based On CSCO2301	CSCO2403	Lab Course I: Based On 2401
CSCO2304	Lab Course II: based On CSCO2302	CSCO2404	Lab Course II : Based On CSCO2402 with Mini Project
Certificate Course I		Certificate Course II	
Environment Science (EVS) An Educational Trip conduct in IV semester			

Class: T.Y.B.Sc. (Computer Science)			
Semester V		**Semester VI**	
CSCO3501	System Programming &Operating System	CSCO3601	Advanced Operating System
CSCO 3502	Theoretical Computer Science	CSCO3602	Compiler Construction
CSCO3503	Computer Networks - I	CSCO3603	Computer Networks - II
CSCO3504	Web Development – I	CSCO3604	Web Development–II
CSCO3505	Advanced Programming in Java	CSCO3605	Advanced Java Technologies – Frameworks
CSCO3506	Object Oriented Software Engineering	CSCO3606	Software Metrics & Project Management
CSCO3507	Lab Course I: Based on CSCO3501	CSCO3607	Lab Course I: Based on CSCO3601
CSCO3508	Lab Course II: Based on CSCO3505	CSCO3608	Lab Course II: Based on CSCO3605 & Mini Project using JAVA
CSCO3509	Lab Course III: Based on CSCO3504	CSCO3609	Lab Course III: Based on CSCO3604 & Mini Project using PHP.
Certificate Course III		An Educational Trip conduct in this semester.	

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

Semester-I

Syllabus

(Academic Year 2019-2020, Autonomous)

Course Structure for F. Y. B. Sc. (Computer Science)
Subject: Computer Science

Sem	Paper Code	Title of Paper	No. of Credits	Exam	Marks
I	CSCO1101	Basic Programming using C	2	I / E	60 + 40
	CSCO 1102	DBMS – I	2	I / E	60 + 40
	CSCO1103	Lab Course – I Basics on C	2	I / E	60 + 40
	CSCO1104	Lab Course – II Based on DBMS I	Grade	I/E	60 +40
II	CSCO 1201	Advanced Programming using C	2	I / E	60 + 40
	CSCO 1202	DBMS – II	2	I / E	60 + 40
	CSCO 1203	Lab Course – I Advanced C Prog.	2	I / E	60 + 40
	CSCO1204	Lab Course– II DBMS II (PL/PgSql)	Grade	I/E	60 + 40
		Physical Education	2	----	----

SYLLABUS (CBCS) FOR F. Y. B. Sc. (Computer Science)
(w.e.f from June, 2019)
Academic Year 2019-2020

Class : F.Y. B. Sc.(Computer Science) (Semester- I)
Subject : Computer Science Paper Code : CSCO1101
Title of Paper: Basic Programming Using C Paper : I
Credit: 2 No. of lectures: 36

Learning Objectives: Students successfully completing this course will be able:

1. To understand and design algorithm for problem solving
2. To develop Problem Solving abilities using computers
3. To develop skills for writing programs using 'C'

Learning Outcome:

CO1: Understanding of Basic Programming Concepts
CO2: Problem solving and programming capability.
CO3: Explore algorithmic approaches to problem solving.
CO4: Develop programs using control structures and arrays in 'C'.
CO5: Gain proficiency in C programming syntax and semantics
CO6: Basic Input/ Output Operations
CO7: Ability to Write and Debug C Code.

Chapter	Topic Contents	No. of Lectures
Unit – I	**Problem-Solving Using Computer** 1.1 Problem Solving 1.2 Algorithms& Flowcharts (More Problems covered) 1.3. Programming Languages Machine language Assembly language High level languages	8
Unit – II	**Introduction to C** 2.1 History 2.2 Structure of a C program 2.3 Application Areas 2.4 C Program development life cycle 2.5 Sample programs	2
Unit – III	**C Tokens** 3.1 Keywords 3.2 Identifiers 3.3 Variables 3.4 Constants – character, integer, float, string, escape sequences 3.5 Data types – built-in and user defined 3.6 Operators and Expressions Operator types (arithmetic, relational, logical,assignment, bitwise, conditional , other operators), precedence and associatively rules.	5
Unit – IV	**Control Structures**	8

	4.1 Decision making structures If, if-else, switch 4.2 Loop Control structures While, do-while, for 4.3 Nested structures 4.4 break, continue andgoto	
Unit – V	**Functions in C** 5.1 What is a 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, storage classes 5.6 Recursion	8
Unit – VI	**Arrays** 6.1 Array declaration, initialization 6.2 Types – one, two and multidimensional 6.3 Passing arrays to functions	5

References:

1. Yashavant Kanetkar : Let Us C 7th Edition, PBP Publications
2. E Balaguruswamy : Programming in ANSI C 4th Edition, Tata Mc-Graw Hill Publishing Co.Ltd.-New Delhi
3. Brian W. Kernighan and Dennis M. Ritchie : The C Programming Language 2nd Edition, Prentice Hall Publication
4. The Complete Reference to C, Herbert Schildt
5. Problem Solving with C, Harrow
6. Yeshwant Kanitkar :Graphics using C- BPB Publication.

Course Objectives (CO) and Program Outcomes (PO) Mapping:

Course Outcomes	**Programme Outcomes (POs)**						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	2	2	3	2
CO2	3	3	3	3	3	3	3
CO3	3	3	3	3	3	3	3
CO4	3	3	2	2	2	2	3
CO5	3	3	2	2	2	3	3
CO6	2	1	1	1	1	2	2
CO7	3	3	2	3	2	3	3

1. Justification of PO1 to ALL COs:

- **PO1:** Apply fundamental principles and methods of Computer Science to a wide range of applications.

CO1: 3 (Strongly Relates)-A solid understanding of basic programming concepts is fundamental to applying the principles and methods of computer science to a wide range of applications.

CO2: 3 (Strongly Relates)-Problem-solving and programming capability are essential skills for applying fundamental principles to various applications.

CO3:3 (Strongly Relates)

Justification: Algorithmic approaches to problem-solving are a core part of the fundamental principles in computer science, contributing to their application in various scenarios.
CO4: 3 (Strongly Relates) - The ability to develop programs using control structures and arrays is a practical application of fundamental principles in programming, aligning with the wider range of applications.
CO5: 3 (Strongly Relates)
Proficiency in C programming syntax and semantics is crucial for applying fundamental principles effectively to a variety of applications.
CO6: 2 (Moderately Related)
While basic input/output operations contribute to a wider range of applications, they may not be as directly tied to fundamental principles as some other course outcomes.
CO7:3 (Strongly Relates)
The ability to write and debug C code is essential for applying fundamental principles in practice, ensuring the correctness and efficiency of programs in various applications (PO1).

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2. Justification of PO2 to ALL COs:

- **PO2:** Design, correctly implement and document solutions to significant computational problems.

CO1: 2 (Moderately Related)
While a foundational understanding of basic programming concepts contributes to designing and implementing solutions,
CO2: 3 (Strongly Relates)
Problem-solving and programming capability are crucial for designing and correctly implementing solutions to computational problems
CO3: 3 (Strongly Relates)
Exploring algorithmic approaches is directly tied to designing effective solutions to computational problems.
CO4: 3 (Strongly Relates)
Developing programs using control structures and arrays is a practical application of designing and implementing solutions to computational problems.
CO5: 3 (Strongly Relates)
Proficiency in C programming is essential for correctly implementing solutions to computational problems and is directly related to the program outcome.
CO6: 1 (Partially Related)
Justification: While basic input/output operations contribute to the overall understanding of program functionality
CO7: 3 (Strongly Relates)
The ability to write and debug code is critical for correctly implementing solutions and is strongly related to the program outcome.

3.Justification of PO3 to ALL COs :

- **PO3:** Impart an understanding of the basics of our discipline.

CO1: 3 (Strongly Relates)-Understanding basic programming concepts is fundamental to the basics of the computer science discipline.
CO2:3 (Strongly Relates)- Problem-solving and programming capability are core aspects of the basics of the computer science discipline.
CO3: 3 (Strongly Relates)- Exploring algorithmic approaches is directly tied to the basics of computer science, as algorithms form a fundamental part of the discipline.
CO4: 2 (Moderately Related)While developing programs is essential to the discipline, the focus on control structures and arrays in C may be seen as a more specific application
CO5: 2 (Moderately Related)-Proficiency in syntax and semantics is crucial, but it is a specific skill within the broader discipline. It is moderately related as it contributes to the basics but is not the entirety of the discipline.

CO6: 1 (Partially Related)- Basic Input/Output Operations contribute to understanding program functionality,
CO7: 2 (Moderately Related) Writing and debugging code are essential skills within the discipline, but they are more specific aspects of the broader basics of computer science.

4. Justification of PO4 to ALL COs:

PO4: Prepare for continued professional development.

CO1: 2 (Moderately Related)-While understanding basic programming concepts is crucial for continued professional development.
CO2: 3 (Strongly Relates)- Problem-solving and programming capability are directly tied to the ability to prepare for continued professional development. These skills are essential for adapting to new challenges and technologies in the professional environment.
CO3:3 (Strongly Relates)
Exploring algorithmic approaches is closely related to preparing for continued professional development, as it enhances the ability to approach new problems and find effective solutions.
CO4: 2 (Moderately Related)- Developing programs using specific language features (control structures and arrays in C) is a technical skill that contributes to professional development, but it is more specific and may not cover the full spectrum of skills needed for continued development.
CO5: 2 (Moderately Related) - Proficiency in C programming is a technical skill that contributes to professional development, but it is moderately related as continued development often involves a broader set of skills and knowledge.
CO6: 1 (Partially Related)
Basic Input/Output Operations are important, but they are more specific and may not directly address the wider range of skills needed for continued professional development.
CO7: 3 (Strongly Relates)- The ability to write and debug code is a practical skill that strongly relates to preparing for continued professional development, as these skills are transferable to various programming languages and environments

5.Justification of PO5 to ALL COs:

CO1: 2 (Moderately Related)-Understanding basic programming concepts contributes to the technical foundation required to analyze IT solutions, but the direct impact on societal and environmental contexts may be more indirect.
CO2: 3(Strongly Relates)- Problem-solving and programming capability are directly relevant to understanding the impact of IT analyst solutions in societal and environmental contexts. The ability to develop effective solutions aligns with the goal of sustainable development.
CO3: 3 (Strongly Relates)- Exploring algorithmic approaches enhances problem-solving skills, contributing to the understanding of the impact of IT analyst solutions in societal and environmental contexts.
CO4: 2 (Moderately Related)- Developing programs using specific language features is relevant to IT solutions, but the direct connection to societal and environmental impact may be more indirect.
CO5: 2 (Moderately Related)
Proficiency in C programming contributes to the technical aspect of IT solutions but is moderately related to the broader societal and environmental impacts.
CO6: 1 (Partially Related)-
Basic Input/Output Operations contribute to the technical understanding but may not be as directly related to the societal and environmental impact of IT solutions.
CO7: 2 (Moderately Related)
The ability to write and debug code is relevant to developing effective IT solutions, but its direct impact on societal and environmental contexts is more indirect.

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6. Justification of PO6 to ALL COs:

PO6: Develop proficiency in the practice of computing.

CO1: 3(Strongly Relates): A solid understanding of basic programming concepts is crucial for developing proficiency in the practice of computing.
CO2: 3 (Strongly Relates)- Problem-solving and programming capability are essential components for developing proficiency in the practice of computing.
CO3: 3 (Strongly Relates)
Exploring algorithmic approaches enhances problem-solving skills, directly contributing to proficiency in the practice of computing.
CO4: 2 (Moderately Related)- Developing programs using control structures and arrays in C contributes to proficiency but is more specific compared to the broader practice of computing.
CO5: 3 (Strongly Relates)
Proficiency in C programming syntax and semantics is a key element for developing overall proficiency in the practice of computing.
CO6: 2 (Moderately Related)- Basic Input/Output Operations contribute to proficiency but are more specific compared to the broader practice of computing.
CO7: 3 (Strongly Relates)- The ability to write and debug code is essential for developing proficiency in the practice of computing.

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7. Justification of PO7 to ALL COs:

PO7: Develop the capacity to study and research independently that will help to develop skills for transition to employment in hardware/software companies.
CO1: 2 (Moderately Related)- Understanding basic programming concepts contributes to the foundation needed for independent study and research,
CO2: 3 (Strongly Relates)- Problem-solving and programming capability are fundamental for independent study and research, directly aligning with the goal of transitioning to employment in hardware/software companies.
CO3: 3 (Strongly Relates)- Exploring algorithmic approaches enhances problem-solving skills, directly contributing to independent study and research crucial for transitioning to employment in hardware/software companies.
CO4:3 (Strongly Relates)- Developing programs using control structures and arrays in C is a practical application of problem-solving skills, directly contributing to the transition to employment in hardware/software companies.
CO5: 3 (Strongly Relates)- Proficiency in C programming syntax and semantics is essential for independent study and research, aligning directly with the skills needed for employment in hardware/software companies.
CO6: 2 (Moderately Related)- Basic Input/Output Operations contribute to technical proficiency but are moderately related as additional skills are required for a comprehensive transition to employment.
CO7: 3 (Strongly Relates)
The ability to write and debug code is crucial for independent study, research, and directly aligns with the skills needed for a successful transition to employment in hardware/software companies.

F.Y. B. Sc. (Computer Science) (Semester- I) (wef. 2019-20)

Subject : Computer Science **Paper Code**: **CSCO1102**

Title of Paper: DBMS-I **Paper**: II

Credit: 2 **No. of lectures**: 36

Learning objective: Students successfully completing this course will be able to:

- Understand design and implementation of a database system.
- Study the physical, logical database designs and database modeling.
- Understanding and development for essential DBMS concepts.
- Understand creations, manipulation and querying of data in databases.

Learning Outcomes:

CO1: Master the basics of database concepts and database management system

CO2: Model an application's data requirements using conceptual modelling tools like ER Model, relational model.

CO3: Demonstrate the basic elements of a relational database management system

CO4: Identify the data models for relevant problems.

CO5: Draw Entity-Relationship diagrams to represent simple database application Scenarios

CO6: Write SQL commands to create tables, insert, update, delete and querying data

CO7: Study the hashing, indexing, and file organization systems.

Units	Title & Content	No. Of lecture
Unit I	**1. Introduction to File organization & DBMS** 1.1 Introduction 1.2 Types of file organization 1.3 File system Vs DBMS 1.4 Data models 1.5 Levels of abstraction 1.6 Data independence 1.7 Structure of DBMS 1.8 Users of DBMS 1.9 Advantages of DBMS	**04**
Unit II	**2.Conceptual Design (E-R model)** 2.1 Overview of DB design 2.2 ER data model (entities , attributes, entity sets, relations, relationship sets) 2.3 Additional constraints (Key constraints, Mapping constraints), 2.4 Conceptual design using ER modelling 2.4 Case studies	**10**
Unit III	**3. Relational data model** 3.1 Structure of Relational Databases (concepts of a table, a row, a relation, a Tuple and a key in a relational database) 3.2 Conversion of ER to Relational model 3.3. Integrity constraints (primary key, referential integrity, unique constraint, Null constraint, Check constraint)	**04**
Unit IV	**4. Relational algebra** 4.1 Preliminaries 4.2 Relational algebra (selection, projection set operations, renaming, joins, division) 4.3 Problems.	**04**

Unit V	**5. Introduction to SQL** 5.1 Introduction 5.2 Basic structure 5.3 Set operations 5.4 Aggregate functions 5.5 Null values 5.6 PL/PgSqL: Data types, Language structure	**08**
Unit VI	**6. Operations with SQL** 6.1 Nested Subqueries 6.2 Modifications to Database 6.3 DDL and DML commands with examples 6.4 SQL mechanisms for joining relations (inner joins, outer joins and their types) 6.5 Examples on SQL (case studies)	**06**

References

1. Shamkant B. Navathe, RamezElmasri, Database Systems, ,ISBN:9780132144988, PEARSON HIGHER EDUCATION
2. Richard Stones, Neil Matthew, Beginning Databases with PostgreSQL: From Novice to Professional, ISBN:9781590594780, Apress
3. Korry Douglas, Postgre SQL, ISBN:9780672327568, Sams
4. ,John Worsley, Joshua Drake , Practical PostgreSQL(BCD),ISBN:9788173663925 Shroff/O'reilly
5. Joshua D. Drake, John C Worsley , Practical Postgresql , **(O'Reilly publications)**
6. Bipin C Desai , "An introduction to Database systems" , Galgotia Publications
7. Henrey Korth, Sudarshan, Silberschatz "Database System Concepts" (4th Ed), McGraw Hill,.

Mapping of this course with Program Outcomes

Course Outcomes	**Programme Outcomes (POs)**						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	2	2	2	2
CO2	3	2	3	2	2	2	2
CO3	3	2	3	2	2	2	2
CO4	3	2	3	2	2	2	2
CO5	3	2	3	2	2	2	2
CO6	3	2	3	2	2	2	2
CO7	2	2	2	2	2	2	2

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

1. **Justification of PO1 to ALL CO's:**

CO1: PO1 - Justification: Mastering the basics of database concepts and management systems strongly contributes to applying fundamental principles and methods of Computer Science to a wide range of applications, as databases are fundamental to various computing applications.

CO2: PO1 - Justification: Modeling an application's data requirements using conceptual modeling tools like ER Model and relational model strongly contributes to applying fundamental principles, enabling effective representation and organization of data in diverse applications.

CO3: PO1 - Justification: Demonstrating the basic elements of a relational database management system strongly contributes to applying fundamental principles in computer science, showcasing practical knowledge in managing relational databases.
CO4: PO1 - Justification: Identifying the data models for relevant problems strongly contributes to applying fundamental principles, allowing for the selection of appropriate data models based on the requirements of diverse applications.
CO5: PO1 - Justification: Drawing Entity-Relationship diagrams to represent simple database application scenarios strongly contributes to applying fundamental principles, providing visual representations for effective communication and understanding of database structures.

CO6: PO1 - Justification: Writing SQL commands to create tables, insert, update, delete, and querying data strongly contributes to applying fundamental principles, as SQL is a fundamental language for interacting with relational databases in various applications.
CO7: PO1 - Justification: Studying hashing, indexing, and file organization systems moderately contributes to applying fundamental principles, as it provides additional knowledge relevant to efficient data retrieval and storage, enhancing the application of computer science principles.

2. Justification of PO2 to ALL CO's:

CO1: PO2 - Justification: Mastering the basics of database concepts and management systems moderately contributes to designing, implementing, and documenting solutions to significant computational problems, as databases are integral to various computational solutions.
CO2: PO2 - Justification: Modeling an application's data requirements using conceptual modeling tools like ER Model and relational model moderately contributes to designing and implementing solutions to computational problems, providing a structured approach to data representation.
CO3: PO2 - Justification: Demonstrating the basic elements of a relational database management system moderately contributes to designing and implementing solutions, showcasing practical knowledge in managing relational databases as part of computational solutions.
CO4: PO2 - Justification: Identifying the data models for relevant problems moderately contributes to designing and implementing solutions, enabling the selection of appropriate data models based on the computational problem at hand.
CO5: PO2 - Justification: Drawing Entity-Relationship diagrams to represent simple database application scenarios moderately contributes to designing and implementing solutions, offering a visual representation for planning and documenting computational solutions involving databases.
CO6: PO2 - Justification: Writing SQL commands to create tables, insert, update, delete, and querying data moderately contributes to designing and implementing solutions, as SQL is a practical language for interacting with databases in various computational contexts.
CO7: PO2 - Justification: Studying hashing, indexing, and file organization systems moderately contributes to designing and implementing solutions, providing additional knowledge relevant to efficient data retrieval and storage as part of computational problem-solving.

3. Justification of PO3 to ALL CO's:

CO1: PO3 - Justification: Mastering the basics of database concepts and management systems strongly contributes to imparting an understanding of the basics of the computer science discipline, providing fundamental knowledge in a core area of the field.
CO2: PO3 - Justification: Modeling an application's data requirements using conceptual modeling tools like ER Model and relational model strongly contributes to imparting an understanding of the basics of the discipline, involving structured approaches to data representation in various applications.
CO3: PO3 - Justification: Demonstrating the basic elements of a relational database management system strongly contributes to imparting an understanding of the basics, as it involves practical knowledge in managing relational databases, a key component in the field of computer science.

CO4: PO3 - Justification: Identifying the data models for relevant problems strongly contributes to imparting an understanding of the basics, involving the selection of appropriate data models based on the computational problem, which is fundamental to the discipline.
CO5: PO3 - Justification: Drawing Entity-Relationship diagrams to represent simple database application scenarios strongly contributes to imparting an understanding of the basics, providing visual representation skills crucial in computer science.
CO6: PO3 - Justification: Writing SQL commands to create tables, insert, update, delete, and querying data strongly contributes to imparting an understanding of the basics, as SQL is a practical language for interacting with databases, an essential aspect of computer science.
CO7: PO3 - Justification: Studying hashing, indexing, and file organization systems moderately contributes to imparting an understanding of the basics, offering additional knowledge relevant to efficient data retrieval and storage in computer science applications.

4. Justification of PO4 to ALL CO's:
CO1: PO4 - Justification: Mastering the basics of database concepts and management systems moderately contributes to preparing for continued professional development by providing foundational knowledge in a core area of the computer science discipline.
CO2: PO4 - Justification: Modeling an application's data requirements using conceptual modeling tools like ER Model and relational model moderately contributes to preparing for continued professional development, offering structured approaches to data representation essential for ongoing growth in the field.
CO3: PO4 - Justification: Demonstrating the basic elements of a relational database management system moderately contributes to preparing for continued professional development, showcasing practical knowledge in managing relational databases, a skill relevant for professional advancement.
CO4: PO4 - Justification: Identifying the data models for relevant problems moderately contributes to preparing for continued professional development, involving the selection of appropriate data models based on the computational problem, a skill valuable for ongoing professional growth.
CO5: PO4 - Justification: Drawing Entity-Relationship diagrams to represent simple database application scenarios moderately contributes to preparing for continued professional development, as it hones visual representation skills crucial for effective communication and collaboration in a professional setting.
CO6: PO4 - Justification: Writing SQL commands to create tables, insert, update, delete, and querying data moderately contributes to preparing for continued professional development, as SQL proficiency is a practical skill valuable for various professional roles.
CO7: PO4 - Justification: Studying hashing, indexing, and file organization systems moderately contributes to preparing for continued professional development, offering additional knowledge relevant to efficient data management, a skill beneficial for ongoing career advancement

5. Justification of PO5 to ALL CO's:
CO1: PO5 - Justification: Mastering the basics of database concepts and management systems moderately contributes to understanding the impact of IT analyst solutions in societal and environmental contexts, as databases are integral to various IT solutions with potential societal and environmental implications.
CO2: PO5 - Justification: Modeling an application's data requirements using conceptual modeling tools like ER Model and relational model moderately contributes to understanding the impact, involving structured approaches to data representation that may influence societal and environmental considerations in IT solutions.
CO3: PO5 - Justification: Demonstrating the basic elements of a relational database management system moderately contributes to understanding the impact, showcasing practical knowledge in managing relational databases, a skill relevant to the societal and environmental implications of IT solutions.
CO4: PO5 - Justification: Identifying the data models for relevant problems moderately contributes to understanding the impact, as selecting appropriate data models is essential for developing IT solutions that align with societal and environmental considerations.

CO5: PO5 - Justification: Drawing Entity-Relationship diagrams to represent simple database application scenarios moderately contributes to understanding the impact, providing visual representation skills that can aid in conveying complex IT solutions in societal and environmental contexts.
CO6: PO5 - Justification: Writing SQL commands to create tables, insert, update, delete, and querying data moderately contributes to understanding the impact, as proficiency in SQL is crucial for developing IT solutions with societal and environmental awareness.
CO7: PO5 - Justification: Studying hashing, indexing, and file organization systems moderately contributes to understanding the impact, offering additional knowledge relevant to efficient data management that can have implications for societal and environmental sustainability.

6. Justification of PO6 to ALL CO's:
CO1: PO6 - Justification: Mastering the basics of database concepts and management systems moderately contributes to developing proficiency in the practice of computing, as databases are integral to various computing practices.
CO2: PO6 - Justification: Modeling an application's data requirements using conceptual modeling tools like ER Model and relational model moderately contributes to developing proficiency, involving structured approaches to data representation that enhances proficiency in computing practices.
CO3: PO6 - Justification: Demonstrating the basic elements of a relational database management system moderately contributes to developing proficiency, showcasing practical knowledge in managing relational databases, a skill relevant to computing practices.
CO4: PO6 - Justification: Identifying the data models for relevant problems moderately contributes to developing proficiency, as selecting appropriate data models is essential for effective problem-solving in computing practices.
CO5: PO6 - Justification: Drawing Entity-Relationship diagrams to represent simple database application scenarios moderately contributes to developing proficiency, providing visual representation skills that aid in effective communication and understanding in computing practices.
CO6: PO6 - Justification: Writing SQL commands to create tables, insert, update, delete, and querying data moderately contributes to developing proficiency, as SQL proficiency is crucial for effective data manipulation and retrieval in computing practices.
CO7: PO6 - Justification: Studying hashing, indexing, and file organization systems moderately contributes to developing proficiency, offering additional knowledge relevant to efficient data management that enhances proficiency in computing practices.

7. Justification of PO7 to ALL CO's:
CO1: PO7 - Justification: Mastering the basics of database concepts and management systems moderately contributes to developing the capacity to study and research independently, providing foundational knowledge that supports independent exploration in the field.
CO2: PO7 - Justification: Modeling an application's data requirements using conceptual modeling tools like ER Model and relational model moderately contributes to developing the capacity for independent study and research, offering structured approaches to data representation that can be independently explored.
CO3: PO7 - Justification: Demonstrating the basic elements of a relational database management system moderately contributes to developing the capacity for independent study and research, showcasing practical knowledge in managing relational databases that can be further explored independently.
CO4: PO7 - Justification: Identifying the data models for relevant problems moderately contributes to developing the capacity for independent study and research, as it involves selecting appropriate data models, which can be explored independently for various computational problems.
CO5: PO7 - Justification: Drawing Entity-Relationship diagrams to represent simple database application scenarios moderately contributes to developing the capacity for independent study and research, providing visual representation skills that can be independently applied and explored.

CO6: PO7 - Justification: Writing SQL commands to create tables, insert, update, delete, and querying data moderately contributes to developing the capacity for independent study and research, as SQL proficiency enables independent exploration in data manipulation and retrieval.
CO7: PO7 - Justification: Studying hashing, indexing, and file organization systems moderately contributes to developing the capacity for independent study and research, offering additional knowledge for independent exploration in efficient data management.

F.Y. B. Sc.(Computer Science) Semester I (wef. 2019-20)

Subject : Computer Science **Paper Code : CSCO1103**

Title of Paper: Lab Course – I (Basic C) **Paper : III (Lab Course-I)**

Credit: 2 **No. of Practical : 10 /Semester**

Learning Objectives: Students successfully completing this course will be able to:

1. Design and implement a 'C' programs for different problems
2. Understand appropriate use of language structure.

Learning Outcome:

CO1: Problem solving and programming capability.
CO2: Apply C programming concepts to real-world problems
CO3: Gain a foundation for advanced programming concepts
CO4: Develop debugging and error handling skills.
CO5: Understand the fundamentals of C programming language:
CO6: Develop problem-solving skills
CO7: Gain proficiency in C programming syntax and semantics

Semester I (Credits – 02) No. of Practicals – 10)	
	Title of Experiment/ Practical
1	Assignment to demonstrate use of data types, simple operators & expressions.
2	Assignment to demonstrate decision making statements (if and if-else, nested structures)
3	Assignment to demonstrate decision making statements (switch - case)
4	Assignment to demonstrate use of simple loops
5	Assignment to demonstrate use of nested loops
6	Assignment to demonstrate menu driven programs.
7	Assignment to demonstrate writing C programs in modular way (use of user defined functions)
8	Assignment to demonstrate recursive functions.
9	Assignment to demonstrate use of arrays (1-d arrays) and functions
10	Assignment to demonstrate use of arrays (1-d arrays) and functions

Course Objectives (CO) and Program Outcomes (PO) Mapping:

Course Outcomes	Programme Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	3	3	3	2	3	2
CO2	3	3	3	3	2	3	3
CO3	3	3	3	3	2	3	3
CO4	2	2	2	2	1	2	2
CO5	3	2	2	2	1	3	2
CO6	2	1	1	1	1	2	1
CO7	2	2	2	2	1	3	3

1. Justification of PO1 to ALL COs:

CO1:PO1 Justification: Understanding basic programming concepts is fundamental to applying the principles and methods of Computer Science to various applications.

CO2: PO1 - Justification: The ability to solve problems and program effectively is a fundamental application of Computer Science principles.

CO3: PO1 - Justification: Algorithmic approaches are a fundamental aspect of Computer Science, applied in a wide range of applications.

CO4: PO1 - Justification: While developing programs using control structures and arrays is a crucial programming skill, its direct application to a wide range of applications might be more moderate compared to broader concepts.

CO5: PO1 - Justification: Proficiency in programming syntax and semantics is essential for applying Computer Science principles effectively.

CO6: PO1 - Justification: Basic Input/Output Operations are essential, but their direct application to a wide range of applications may be moderate compared to more foundational concepts.

CO7:PO1 - Justification: While writing and debugging code is an important skill, its direct connection to a wide range of applications might be more moderate compared to broader principles.

2. Justification of PO2 to ALL COs:

CO1:PO2 - Justification: A solid understanding of basic programming concepts is crucial for designing and implementing solutions to computational problems.

CO2: PO2 - Justification: Problem-solving and programming capability are directly tied to designing and implementing solutions to computational problems.

CO3: PO2 - Justification: Exploring algorithmic approaches is a key aspect of designing efficient solutions to computational problems.

CO4: PO2 Justification: While developing programs with control structures and arrays is important, the direct link to designing solutions to significant computational problems may be more moderate compared to broader concepts.

CO5: PO2 - Justification: Proficiency in syntax and semantics is essential, but its direct relation to designing solutions to significant computational problems might be more moderate compared to broader principles.

CO6: PO2 - Justification: While basic I/O operations are important, their direct connection to designing solutions to significant computational problems is partial.

CO7: PO2 Justification: Writing and debugging code are important skills but are more moderately related to the overall process of designing solutions to significant computational problems.

3. Justification of PO3 to ALL COs:

CO1:PO3 - Justification: A strong understanding of basic programming concepts is fundamental to imparting an understanding of the basics of the computer science discipline.

CO2:PO3 - Justification: Problem-solving and programming capability are essential components of the basics of the computer science discipline.

CO3: PO3 Justification: Exploring algorithmic approaches is a core aspect of understanding the basics of computer science.

CO4: PO3 - Justification: While developing programs is important, its direct relation to understanding the basics of the discipline might be more moderate compared to broader concepts.
CO5: PO3- Justification: Proficiency in syntax and semantics is crucial, but its direct connection to understanding the basics of the discipline may be more moderate compared to broader principles.
CO6: PO3 - Justification: While basic I/O operations are important, their direct connection to understanding the basics of the discipline is partial.
CO7: PO3 - Justification: Writing and debugging code are important skills, but their direct relation to understanding the basics of the discipline may be more moderate.

4. Justification of PO4 to ALL COs:

CO1: PO4 - Justification: A strong understanding of basic programming concepts is foundational for continued professional development in the field of computer science.
CO2: PO4 - Justification: Problem-solving and programming capability are crucial skills that directly contribute to an individual's readiness for continued professional development.
CO3: PO4 - Justification: Exploring algorithmic approaches is an essential skill that enhances an individual's ability to address complex problems, contributing to professional development.
CO4: PO4 - Justification: While developing programs is important, its direct connection to continued professional development might be more moderate compared to broader concepts.
CO5: PO4 - Justification: Proficiency in syntax and semantics is valuable, but its direct elation to continued professional development may be more moderate compared to broader principles.
CO6: PO4 - Justification: Basic I/O operations are important, but their direct connection to continued professional development is partial.
CO7: PO4 - Justification: Writing and debugging code are important skills, but their direct relation to continued professional development may be more moderate.

5 Justification of PO5 to ALL COs:

CO1: PO5 Justification: While a foundational understanding of programming concepts is essential, the direct connection to understanding the societal and environmental impact may be more moderate compared to broader concepts.
CO2: PO5 Justification: Problem-solving and programming capability contribute to IT solutions, but their direct relation to societal and environmental impact might be more moderate compared to broader considerations.
CO3:PO5 Justification: Exploring algorithmic approaches is important, but the direct connection to societal and environmental impact may be more moderate compared to broader considerations.
CO4: PO5 Justification: Developing programs is a technical skill, but its direct connection to societal and environmental impact may be partial compared to broader considerations.
CO5: PO5 Justification: Proficiency in syntax and semantics is essential but may have a partial connection to the broader societal and environmental impact.
CO6: PO5 Justification: Basic I/O operations are fundamental but may only partially contribute to understanding the broader societal and environmental impact.
CO7: PO5 Justification: Writing and debugging code are technical skills, but their direct relation to societal and environmental impact may be partial compared to broader considerations.

6. Justification of PO6 to ALL COs:

CO1: PO6 Justification: A solid understanding of basic programming concepts is foundational for developing proficiency in the practice of computing.
CO2: PO6 Justification: Problem-solving and programming capability are core skills that directly contribute to proficiency in the practice of computing.
CO3: PO6 Justification: Exploring algorithmic approaches is crucial for developing proficiency in the practice of computing, as it enhances problem-solving skills.
CO4: PO6 Justification: Developing programs is important, and it contributes to proficiency in the practice of computing, but its direct connection may be more moderate compared to broader concepts.
CO5: PO6 Justification: Proficiency in syntax and semantics is essential for developing proficiency in the practice of computing.
CO6: PO6 Justification: Basic Input/Output Operations are fundamental, but their direct connection to the broader proficiency in the practice of computing may be more moderate.
CO7: PO6 Justification: Writing and debugging code are core skills that directly contribute to proficiency in the practice of computing.

7. Justification of PO7 to ALL COs:

CO1: PO7 Justification: While a foundational understanding of programming concepts is important, the direct connection to independent study and research for employment transition may be more moderate compared to broader considerations.

CO2: PO7 Justification: Problem-solving and programming capability are essential skills that directly contribute to independent study and research for a successful transition to employment in the tech industry.

CO3: PO7 Justification: Exploring algorithmic approaches enhances problem-solving skills and contributes directly to the capacity for independent study and research, supporting the transition to employment.

CO4: PO7 Justification: Developing programs is important, but its direct connection to independent study and research for employment transition may be more moderate compared to broader concepts.

CO5: PO7 Justification: Proficiency in syntax and semantics is crucial, but its direct relation to independent study and research for employment transition may be more moderate compared to broader principles.

CO6: PO7 Justification: Basic Input/Output Operations are fundamental, but their direct connection to independent study and research for employment transition may be partial.

CO7: PO7 Justification: Writing and debugging code are core skills that directly contribute to independent study and research for a successful transition to employment in hardware/software companies.

F.Y. B. Sc.(Computer Science) Semester I (wef. 2019-20)

Subject : Computer Science **Paper Code : CSCO1104(Grade)**

Title of Paper: Lab Course – II (DBMS I) **Paper : IV(Lab Course-II)**

Credit : Grade **No. of Practical : 10 /Semester**

Learning Objectives: students successfully completing this course will be able to:

- Define & manipulate the database Concepts.
- Understand SQL with DDL and DML Commands.

Learning Outcome: To know the DBMS Concepts and to operate Database Software.

CO1: Master the basics of database concepts and database management system
CO2: Model an application's data requirements using conceptual modelling tools like ER Model, relational model.
CO3: Demonstrate the basic elements of a relational database management system
CO4: Identify the data models for relevant problems.
CO5: Draw Entity-Relationship diagrams to represent simple database application Scenarios
CO6: Write SQL commands to create tables, insert, update, delete and querying data
CO7: Study the hashing, indexing, and file organization systems.

Semester I No. of Practical's – 10	
	Title of Experiment/ Practical
1	Create simple tables , with only the primary key Constraint
2	Create more than one table with integrity constraint
3	Create more than one table, with referential integrity constraint.
4	Drop a table from database, Alter the table.
5	Insert/Update/Delete statements.
6	Query for the tables using simple form of Select Statement
7	Query solving for table operations(Aggregate function)
8	Nested Query solving for table operations(Union, Intersect, Except)
9	Nested Query solving for table operations(Set membership, Cardinality, Comparison)
10	To Small Case Studies.

Mapping of this course with Program Outcomes

Course Outcomes	Program Outcomes (POs)						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	3	3	2	2	2
CO2	2	2	2	2	2	2	2
CO3	2	1	2	2	1	2	1
CO4	3	2	3	3	2	2	2
CO5	3	2	3	3	2	2	2
CO6	3	2	3	3	2	3	2
CO7	2	3	2	3	2	3	3

Weight: 1 - Partially related 2 - Moderately Related 3 - Strongly related

1. **Justification of PO1 to ALL CO's:**

CO1: PO1 - Justification: Knowing DBMS concepts and operating Database Software strongly contributes to applying fundamental principles of Computer Science in a wide range of applications, as databases are fundamental to various computing applications.

CO2: PO1 - Justification: Identifying and describing components of Internet infrastructure moderately contributes to applying fundamental principles, providing knowledge relevant to networking and internet-based applications widely used in computer science.

CO3: PO1 - Justification: Applying web technologies, including HTML, HTTP, and basic web development principles, moderately contributes to applying fundamental principles in creating and navigating web content, a common application of computer science principles.

CO4: PO1 - Justification: Mastering the basics of database concepts and database management systems strongly contributes to applying fundamental principles in a wide range of applications, as databases are integral to various computing solutions.

CO5: PO1 - Justification: Modeling an application's data requirements using conceptual modeling tools like ER and relational models strongly contributes to applying fundamental principles, involving structured approaches to data representation in diverse applications.

CO6: PO1 - Justification: Writing SQL commands to create tables, insert, update, delete, and query data strongly contributes to applying fundamental principles, as SQL is a practical language for interacting with databases in various applications.

CO7: PO1 - Justification: Implementing code efficiency moderately contributes to applying fundamental principles, addressing the importance of efficient code in a wide range of computer science applications.

2. Justification of PO2 to ALL CO's:

CO1: PO2 - Justification: Knowing DBMS concepts and operating Database Software moderately contributes to designing, correctly implementing, and documenting solutions to computational problems, as databases are often a significant component of computational solutions.

CO2: PO2 - Justification: Identifying and describing components of Internet infrastructure moderately contributes to designing and implementing solutions, providing knowledge relevant to networking and internet-based applications, which are significant in computational problem-solving.

CO3: PO2 - Justification: Applying web technologies, including HTML, HTTP, and basic web development principles, partially contributes to designing and implementing solutions to computational problems, as web technologies may be one aspect of broader solutions.

CO4: PO2 - Justification: Mastering the basics of database concepts and database management systems moderately contributes to designing and implementing solutions, as databases play a crucial role in computational problem-solving.

CO5: PO2 - Justification: Modeling an application's data requirements using conceptual modeling tools like ER and relational models moderately contributes to designing and implementing solutions, providing a structured approach to data representation.
CO6: PO2 - Justification: Writing SQL commands to create tables, insert, update, delete, and query data moderately contributes to designing and implementing solutions, as SQL proficiency is essential in working with databases in computational problem-solving.
CO7: PO2 - Justification: Implementing code efficiency strongly contributes to designing and implementing solutions to computational problems, emphasizing the importance of efficient code in the development of computational solutions.

3. Justification of PO3 to ALL CO's:

CO1: PO3 - Justification: Knowing DBMS concepts and operating Database Software strongly contributes to imparting an understanding of the basics of the computer science discipline, as databases are foundational in computer science.
CO2: PO3 - Justification: Identifying and describing components of Internet infrastructure moderately contributes to imparting an understanding of the basics, providing knowledge relevant to networking and internet-based applications in the field of computer science.
CO3: PO3 - Justification: Applying web technologies, including HTML, HTTP, and basic web development principles, moderately contributes to imparting an understanding of the basics, involving practical knowledge in web technologies, which is a fundamental aspect of the discipline.
CO4: PO3 - Justification: Mastering the basics of database concepts and database management systems strongly contributes to imparting an understanding of the basics, as databases are integral to various computing solutions, reflecting a core component of the discipline.
CO5: PO3 - Justification: Modeling an application's data requirements using conceptual modeling tools like ER and relational models strongly contributes to imparting an understanding of the basics, showcasing structured approaches to data representation in the discipline.
CO6: PO3 - Justification: Writing SQL commands to create tables, insert, update, delete, and query data strongly contributes to imparting an understanding of the basics, as SQL proficiency is fundamental in interacting with databases, a core aspect of computer science.
CO7: PO3 - Justification: Implementing code efficiency moderately contributes to imparting an understanding of the basics, emphasizing the importance of efficient coding practices, which is a foundational skill in computer science.

4. Justification of PO4 to ALL CO's:

CO1: PO4 - Justification: Knowing DBMS concepts and operating Database Software strongly contributes to preparing for continued professional development, providing foundational knowledge in a core area of the computer science discipline.
CO2: PO4 - Justification: Identifying and describing components of Internet infrastructure moderately contributes to preparing for continued professional development, offering knowledge relevant to networking and internet-based applications widely used in computer science.
CO3: PO4 - Justification: Applying web technologies, including HTML, HTTP, and basic web development principles, moderately contributes to preparing for continued professional development, involving practical knowledge in web technologies, which is essential for professional growth.
CO4: PO4 - Justification: Mastering the basics of database concepts and database management systems strongly contributes to preparing for continued professional development, as databases are integral to various computing solutions, reflecting a core component of the discipline.
CO5: PO4 - Justification: Modeling an application's data requirements using conceptual modeling tools like ER and relational models strongly contributes to preparing for continued professional development, showcasing structured approaches to data representation in the discipline.

CO6: PO4 - Justification: Writing SQL commands to create tables, insert, update, delete, and query data strongly contributes to preparing for continued professional development, as SQL proficiency is fundamental in interacting with databases, a core aspect of computer science.
CO7: PO4 - Justification: Implementing code efficiency strongly contributes to preparing for continued professional development, emphasizing the importance of efficient coding practices, which is crucial for ongoing growth in the field.

5. Justification of PO5 to ALL CO's:

CO1: PO5 - Justification: Knowing DBMS concepts and operating Database Software moderately contributes to understanding the impact of IT analyst solutions in societal and environmental contexts, as databases play a role in various IT solutions with potential implications.
CO2: PO5 - Justification: Identifying and describing components of Internet infrastructure moderately contributes to understanding the impact, offering knowledge relevant to networking and internet-based applications that can have societal and environmental implications in IT solutions.
CO3: PO5 - Justification: Applying web technologies, including HTML, HTTP, and basic web development principles, partially contributes to understanding the impact, as web technologies may be one aspect of broader IT solutions with societal and environmental considerations.
CO4: PO5 - Justification: Mastering the basics of database concepts and database management systems moderately contributes to understanding the impact, as databases are integral to various IT solutions that may have societal and environmental implications.
CO5: PO5 - Justification: Modeling an application's data requirements using conceptual modeling tools like ER and relational models moderately contributes to understanding the impact, showcasing structured approaches to data representation that can have societal and environmental considerations.
CO6: PO5 - Justification: Writing SQL commands to create tables, insert, update, delete, and query data moderately contributes to understanding the impact, as proficiency in SQL is crucial for developing IT solutions with societal and environmental awareness.
CO7: PO5 - Justification: Implementing code efficiency moderately contributes to understanding the impact, emphasizing the importance of efficient code in the development of IT solutions with potential societal and environmental implications.

6. Justification of PO6 to ALL CO's:

CO1: PO6 - Justification: Knowing DBMS concepts and operating Database Software moderately contributes to developing proficiency in the practice of computing, as databases are fundamental in computing practices.
CO2: PO6 - Justification: Identifying and describing components of Internet infrastructure moderately contributes to developing proficiency, providing knowledge relevant to networking and internet-based applications, integral to computing practices.
CO3: PO6 - Justification: Applying web technologies, including HTML, HTTP, and basic web development principles, moderately contributes to developing proficiency, involving practical knowledge in web technologies that is commonly used in computing practices.
CO4: PO6 - Justification: Mastering the basics of database concepts and database management systems moderately contributes to developing proficiency, as databases play a crucial role in various computing practices.
CO5: PO6 - Justification: Modeling an application's data requirements using conceptual modeling tools like ER and relational models moderately contributes to developing proficiency, showcasing structured approaches to data representation in computing practices.
CO6: PO6 - Justification: Writing SQL commands to create tables, insert, update, delete, and query data strongly contributes to developing proficiency, as SQL is a fundamental language in computing practices for interacting with databases.
CO7: PO6 - Justification: Implementing code efficiency strongly contributes to developing proficiency in the practice of computing, emphasizing the importance of efficient coding practices in various computing scenarios.

7. Justification of PO7 to ALL CO's:

CO1: PO7 - Justification: Knowing DBMS concepts and operating Database Software moderately contributes to developing the capacity to study and research independently, providing foundational knowledge for independent research in hardware/software domains.

CO2: PO7 - Justification: Identifying and describing components of Internet infrastructure moderately contributes to developing the capacity for independent study and research, offering knowledge relevant to networking and internet-based applications, crucial in hardware/software research.

CO3: PO7 - Justification: Applying web technologies, including HTML, HTTP, and basic web development principles, partially contributes to developing the capacity for independent study and research, as web technologies may be one aspect of broader research areas in hardware/software.

CO4: PO7 - Justification: Mastering the basics of database concepts and database management systems moderately contributes to developing the capacity for independent study and research, as databases are integral to various research areas in hardware/software.

CO5: PO7 - Justification: Modeling an application's data requirements using conceptual modeling tools like ER and relational models moderately contributes to developing the capacity for independent study and research, showcasing structured approaches to data representation in research domains.

CO6: PO7 - Justification: Writing SQL commands to create tables, insert, update, delete, and query data moderately contributes to developing the capacity for independent study and research, as SQL proficiency is fundamental for conducting research involving databases.

CO7: PO7 - Justification: Implementing code efficiency strongly contributes to developing the capacity for independent study and research, emphasizing the importance of efficient coding practices, a crucial skill in research and development in hardware/software.