Anekant Education Society's

Tuljaram Chaturchand College, Baramati

(Autonomous)

B.Sc. Degree Program in Computer Science

(Faculty of Science & Technology)

Syllabus

F.Y.B.Sc.(Computer Science) Semester -II

For Department of Computer Science

Tuljaram Chaturchand College, Baramati

Choice Based Credit System Syllabus (2022 Pattern)

To be implemented from Academic Year 2022-2023

Programs Outcome For B. Sc. (Computer Science)
(2022 Pattern)

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

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

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

PO4: Prepare for continued professional development.

PO5: Understand the impact of the IT analyst solutions in societal and environmental contexts, and demonstrate the knowledge and need for sustainable development.

PO6: Develop proficiency in the practice of computing.

PO7: Develop the capacity to study and research independently that will help to develop skills for transition to employment in hardware/software companies

Course Structure for F.Y.B.Sc.(Computer Science) (2022 Pattern)

Subject: **Computer Science**

Semester	Paper Code	Title of Paper	No. of Credits	Exam.	Marks
I	UCSCO111	Basic Programming using C	2	I/E	60+40
	UCSCO112	DBMS-I	2	I/E	60+40
	UCSCO113	Lab. Course I : Basic programming using C	2	I/E	60+40
	UCSCO114	Lab. Course II : DBMS I	2	I/E	60+40
II	UCSCO121	Advanced Programming using C	2	I/E	60+40
	UCSCO122	DBMS-II	2	I/E	60+40
	UCSCO123	Lab. Course I : Advanced Programming using C	2	I/E	60+40
	UCSCO124	Lab. Course II : DBMS II	2	I/E	60+40
		Physical Education	2	--	--
		Democracy, Election & Governance	2	--	--

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

Semester-II

Class: F.Y. B. Sc. (Computer Science) (Semester- II)

Subject: Computer Science **Paper Code:** UCSCO121

Title of Paper: Advanced Programming Using C **Paper:** II

Credit : 02 **No. of lectures:** 36

Prerequisites:

1. Problem Solving tools like algorithms, flowcharts and pseudocodes.
2. Basic knowledge of 'C' language.

Course Objectives:

Students successfully completing this course will be able:

1. To study advanced concepts of programming using 'C' language.
2. To understand complex data types like structure and union.
3. To work with files.
4. To understand and develop basics of Graphics Programming

Course Outcomes:

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

1. CO1: Develop programs using control structures, pointers, strings, structures and files in 'C'.
2. CO2: Design and develop solutions to real world problems using C.
3. CO3: Explore algorithmic approaches to problem solving.
4. CO4: Develop programs using control structures and arrays in 'C'.
5. CO5: Gain proficiency in C programming syntax and semantics
6. CO6: Basic Input/ Output Operations
7. CO7: Ability to Write and Debug C Code.

	Chapter and Sub Topics	**No. of Lectures**
Unit – I	**Pointers** 1.1Pointer declaration, initialization 1.2 Dereferencing pointers 1.3 Pointer arithmetic 1.4 Pointer to pointer 1.5 Arrays and pointers 1.6 Functions and pointers – passing pointers to functions, function returning pointers 1.7 Dynamic memory allocation	8
Unit – II	**Strings** 2.1 Declaration and initialization, format specifies 2.2 Standard library functions 2.3 Strings and pointers 2.4 Array of strings 2.5 Command Line Arguments	6
Unit – III	**Structures and Unions** 3.1 Creating structures	10

	3.2 Accessing structure members (dot Operator) 3.3 Structure initialization 3.4 Typedef 3.5 Array of structures 3.6 Passing structures to functions 3.7 Nested structures 3.8 Pointers and structures 3.9 Self-referential structure 3.10 Unions 3.11 Difference between structures and unions	
Unit – IV	**File Handling** 4.1 Streams 4.2 Types of Files 4.3 Operations on files 4.4 Random access to files	6
Unit – V	**C Pre-processor** 4.1Format of Pre-processor directive 4.2 File Inclusion directive 4.3 Macro substitution, nested macro, argument macro 4.4 Macros VS Functions	2
Unit – VI	**Graphics programming using C** 6.1 Graphics driver and mode 6.2 Drawing simple graphical objects–line, circle, rectangle etc. 6.3 Outputting text, curves & Polygons	4

Books References:

1. YashavantKanetkar : Let Us C 7th Edition, PBP Publications
2. E Balaguruswamy : Programming in ANSI C 7th 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. Programming in C ,A Practical Approach, Ajay Mittal , Pearson Web References:

1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.w3schools.com/c/index.php
3. https://www.guru99.com/c-programming-tutorial.html
4. https://www.geeksforgeeks.org/c-programming-language/
5. https://nptel.ac.in/courses

Mapping of this course with Programme Outcomes & Justification

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

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

CO1:PO1 - As the advanced C programming concepts contribute directly to applying fundamental principles in various applications.

CO2:PO1: - As proficiency in advanced C features enhances the ability to apply fundamental principles in diverse applications.

CO3:PO1: - As mastery in these concepts is essential for applying fundamental principles in a variety of applications.

CO4:PO1: -As proficiency in memory management is crucial for the development of robust applications in different domains.

CO5:PO1: - As file handling is a specific application but may not cover the entire range of computer science applications.

CO6:PO1: - As preprocessor directives contributes to code organization but may not directly cover a wide range of applications.

CO7:PO1 - As graphics programming is a specific application area, and whiles it contributes to a subset of computer science applications; it may not cover the entire range.

CO1:PO2: - As understanding and designing programs with advanced C concepts are crucial for correctly implementing solutions to computational problems.

CO2:PO2: - As the effective use of advanced C features is essential for correctly implementing solutions to computational problems.

CO3:PO2: - As mastery in these concepts contributes directly to the ability to design and implement solutions to computational problems.

CO4:PO2: - As proficiency in memory management is crucial for correctly implementing solutions to computational problems.

CO5:PO2: - As file handling is relevant for certain computational problems but may not be universally applicable.

CO6:PO2: - As using preprocessor directives contributes to code organization, enhancing the documentation aspect of implementing solutions.

CO7:PO2: - As designing graphics programming solutions is a specific application area, and while it contributes to computational problems, it may not cover the entire range of problems addressed in the PO.

CO1:PO3: - As understanding and designing programs with advanced C concepts contribute to a specific aspect of the discipline but may not cover all basics.

CO2:PO3: - As understanding advanced C features is important but may not encompass all the basics of the discipline.

CO3:PO3: - As mastery in these advanced concepts contributes to a specific subset of basics within the discipline.

CO4:PO3: - As proficiency in memory management is a specific skill within the discipline but does not cover all basics.

CO5:PO3: - As file handling is a specific aspect of the discipline but may not represent all basics.

CO6:PO3: - As understanding and using preprocessor directives contribute to code organization, a specific aspect within the basics of the discipline.

CO7:PO3: - As designing graphics programming solutions is a specific application area within the discipline but may not cover all basics.

CO1:PO4: - As understanding and designing programs with advanced C concepts contributes to technical skills, which are part of professional development but may not cover all aspects.

CO2:PO4: - As proficiency in advanced C features directly contributes to technical skills crucial for continued professional development.

CO3:PO4: -As mastery in advanced concepts enhances technical proficiency, supporting continued professional development.

CO4:PO4: Strongly Related (3) -As proficiency in memory management is a technical skill essential for continued professional development.

CO5:PO4: - As file handling is a technical skill that contributes to professional development but may not cover all aspects.

CO6:PO4: - As using preprocessor directives contributes to code organization, a skill beneficial for professional development but not exhaustive.

CO7:PO4: -As designing graphics programming solutions is a specific application area and may not directly cover the broader aspects of professional development.

CO1:PO5: -As advanced C concepts primarily focus on technical skills, and their direct connection to societal and environmental impact may be limited.

CO2:PO5: -As proficiency in advanced C features is more technical and may not directly address societal and environmental impacts.

CO3:PO5: -As mastery in these advanced concepts is technical and may not directly relate to societal and environmental contexts.

CO4:PO5: -As proficiency in memory management is a technical skill that may not directly address societal and environmental impacts.

CO5:PO5: -As file handling is more technical and may not directly connect to societal and environmental contexts.

CO6:PO5: -As using preprocessor directives is technical and may have limited direct relevance to societal and environmental impact.

CO7:PO5: -As designing graphics programming solutions is a specific technical application and may not inherently address societal and environmental concerns.

CO1:PO6: -As understanding and designing programs with advanced C concepts are fundamental to developing proficiency in computing.

CO2:PO6: -As proficiency in advanced C features is essential for developing proficiency in computing.

CO3:PO6: -As mastery in these advanced concepts contributes directly to the practice of computing.

CO4:PO6: -As proficiency in memory management is crucial for the practice of computing.

CO5:PO6: -As file handling is a practical skill directly contributing to the practice of computing.

CO6:PO6: -As using preprocessor directives contributes to code organization, an essential aspect of practicing computing.

CO7:PO6: -As designing graphics programming solutions is a specific application area within the practice of computing but may not cover the entire range of skills required.

CO1:PO7: -As understanding and designing programs with advanced C concepts contribute to technical skills, which are part of the capacity to study independently, but may not directly cover all aspects needed for employment transition.

CO2:PO7: -As proficiency in advanced C features contributes to technical skills necessary for independent study and research but may not cover the full spectrum.

CO3:PO7: -As mastery in these concepts enhances technical proficiency, supporting independent study, but may not directly address all aspects of independent research.

CO4:PO7: -As proficiency in memory management is a technical skill that contributes to independent study but may not cover all aspects of independent research.

CO5:PO7: -As file handling is a technical skill supporting independent study but may not directly cover all aspects of independent research.

CO6:PO7: -As using preprocessor directives contributes to code organization, a skill beneficial for independent study, but may not cover all aspects of independent research.

CO7:PO7: -As designing graphics programming solutions is a specific technical skill that supports independent study but may not encompass all aspects needed for employment transition.

Class: F.Y. B. Sc. (Computer Science) (Semester- II) (2022 Pattern)

Subject: Computer Science **Paper Code:** UCSCO122

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

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

Prerequisites: Knowledge of DBMS

Course Objectives: -Students successfully completing this course will be able to:

- Understand fundamental concepts of RDBMS (PL/PgSQL)
- Understand data security and its importance.
- Understand client server architecture.

Course Outcome

CO1. Develop the database design by normalization.
CO2. Knowing functional dependencies and design of the relational database.
CO3. Design concept of Transaction and Query processing.
CO4. Analyze the recovery system of different databases.
CO5. Apply normalization concept to real world problems.
CO6. Know the information about different databases
CO7. Understand database integrity & security concept.

Unit	Title & Content	No. of lecture
Unit I	**1. RELATIONAL DATABASE CONCEPT** 1.1 Normalization (1NF,2NF,3NF, BCNF,4NF, 5 NF) 1.2 Controlling the program flow, conditional statements, loops 1.3 Views	**6**
Unit-II	**2. PL/pgSQL** 2.1 Stored Function 2.2 Stored Procedure 2.3 Cursors 2.4 Handling errors and exceptions 2.5 Triggers	**10**
Unit III	**3 TRANSACTION CONCEPTS AND CONCURRENCY CONTROL** 2.1 Transaction, properties of transaction, state of the transaction. 2.2 Executing transactions concurrently associated problem in concurrent execution. 2.3 Schedules, types of schedules, Serializability, precedence graph for Serializability. 2.4 Ensuring Serializability by locks, different lock modes, 2PL and its variations. 2.5Basic timestamp method for concurrency, Thomas Write Rule. 2.6Locks with multiple granularities 2.7 Timestamps versus locking. 2.8 Deadlock handling methods 2.8.1 Detection and Recovery (Wait for graph). 2.8.2 Prevention algorithms (Wound-wait, Wait-die)	**10**
Unit IV	**4 DATABASE INTEGRITY AND SECURITY CONCEPTS** 3.1 Domain constraints 3.2 Referential Integrity 3.3 Introduction to database security concepts	**04**

	3.4 Methods for database security 3.4.1Discretionary access control method 3.4.2Mandatory access control and role base access control for multilevel security. 3.5 Use of views in security enforcement.	
Unit V	**5 CRASH RECOVERY** 4.1 Failure classification 4.2 Recovery concepts 4.3 Log base recovery techniques (Deferred and Immediate update) 4.4 Checkpoint 4.5 Recovery with concurrent transactions (Rollback, checkpoints, commit) 4.6 Database backup and recovery from catastrophic failure. 4.7 DCL Command implementation with example (Grant & Revoke Command)	**04**
Unit VI	**6. INTRODUCTION OF RESENT DATABASE TECHNOLOGIES** 6.1 Structured Database: RDBMS Databases 6.2 Unstructured Database: NOSQL Databases 6.3 Examples	**02**

rstand database integrity & security concept.

References: -

1. Fundamentals of Database Systems (4th Ed) By: Elmasri and Navathe
2. Database System Concepts (4th Ed) By: Korth, Sudarshan, Silberschatz
3. Practical PostgreSQL O'REILLY
4. Beginning Databases with PostgreSQL, From Novice to Professional, 2nd Edition By Richard Stones, Neil Matthew, Apress

RDBMS SEM-II INTERNAL ASSIGNMENT SUBMISSION ON

- Normalization of DB (3 Assignments)
- Schedules (3 Assignment)
- Dead lock Detection and recovery (4 Assignments)

Mapping of this course with Programme Outcomes

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

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

Justification of PO with CO:

1. **PO1 with all CO's :**

   CO1 is strongly related to PO1 as developing the database design by normalization is a fundamental principle in computer science, contributing to broader applications.

CO2 is strongly related to PO1 as knowing functional dependencies and designing relational databases are fundamental concepts in computer science with wide applications.

CO3 is moderately related to PO1 as the design concept of transaction and query processing is a specific area within computer science that contributes to a range of applications.

CO4 is moderately related to PO1 as analyzing the recovery system of different databases is a specific aspect within computer science that is important in various applications.

CO5 is moderately related to PO1 as applying normalization concepts to real-world problems is a specific skill within computer science that has broad applications.

CO6 is partially related to PO1 as knowing information about different databases is specific and may not directly align with the broader range of applications in computer science.

CO7 is moderately related to PO1 as understanding database integrity and security concepts is a specific area within computer science that has applications in various contexts.

2. **PO1 with all CO's :**

CO1 is moderately related to PO2 as developing the database design by normalization is a specific skill that contributes to solving computational problems, but it may not cover the entire spectrum of designing and implementing solutions to computational problems.

CO2 is strongly related to PO2 as knowing functional dependencies and designing relational databases are essential components of designing and implementing solutions to computational problems.

CO3 is moderately related to PO2 as the design concept of transaction and query processing is a specific aspect within the broader context of designing and implementing solutions to computational problems.

CO4 is moderately related to PO2 as analyzing the recovery system of different databases is a specific area within the broader domain of designing and implementing computational solutions.

CO5 is moderately related to PO2 as applying normalization concepts to real-world problems is a specific skill within the context of designing and implementing solutions to computational problems.

CO6 is partially related to PO2 as knowing information about different databases may not directly align with the process of designing and implementing solutions to computational problems.

CO7 is moderately related to PO2 as understanding database integrity and security concepts is a specific aspect within the broader skill set needed for designing and implementing solutions to computational problems.

3. **PO1 with all CO's :**

CO3 is strongly related to PO3 as understanding the design concept of transaction and query processing is fundamental to the basics of the discipline of computer science.

CO1 is moderately related to PO3 as developing the database design by normalization is a specific skill that contributes to the understanding of database concepts, which is part of the basics of the discipline.
CO2 is moderately related to PO3 as knowing functional dependencies and designing relational databases are specific skills within the broader understanding of the basics of the discipline.
CO4 is moderately related to PO3 as analyzing the recovery system of different databases is a specific area within the broader understanding of the basics of the discipline.
CO5 is moderately related to PO3 as applying normalization concepts to real-world problems is a specific skill within the broader understanding of the basics of the discipline.
CO6 is partially related to PO3 as knowing information about different databases may not directly align with the broader understanding of the basics of the discipline.
CO7 is moderately related to PO3 as understanding database integrity and security concepts is a specific aspect within the broader understanding of the basics of the discipline.

4. **PO1 with all CO's :**

CO4 is strongly related to PO4 as analyzing the recovery system of different databases is crucial for preparing for continued professional development, ensuring resilience and reliability in database systems.
CO1 is moderately related to PO4 as developing the database design by normalization is a specific skill that contributes to database proficiency, which is relevant for continued professional development.
CO2 is moderately related to PO4 as knowing functional dependencies and designing relational databases are specific skills within the broader database expertise required for professional development.
CO3 is moderately related to PO4 as understanding the design concept of transaction and query processing is a specific aspect within the broader database management skills needed for continued professional development.
CO5 is moderately related to PO4 as applying normalization concepts to real-world problems is a specific skill within the broader database expertise that contributes to professional development.
CO6 is partially related to PO4 as knowing information about different databases may not be directly aligned with the general preparedness for continued professional development.
CO7 is moderately related to PO4 as understanding database integrity and security concepts is a specific aspect within the broader skills needed for continued professional development.

5. **PO1 with all CO's :**

CO5 is strongly related to PO5 as applying normalization concepts to real-world problems is directly connected to understanding the impact of IT solutions in societal and environmental contexts, emphasizing sustainable development practices.
CO1 is moderately related to PO5 as developing the database design by normalization contributes to general database proficiency, which is a part of the broader understanding of IT solutions' impact on societal and environmental contexts.

CO2 is moderately related to PO5 as knowing functional dependencies and designing relational databases is a specific skill within the broader database expertise that contributes to understanding the impact of IT solutions.

CO3 is moderately related to PO5 as the design concept of transaction and query processing is a specific aspect within the broader database management skills needed to understand the impact of IT solutions.

CO4 is moderately related to PO5 as analyzing the recovery system of different databases is a specific skill within the broader database expertise that contributes to understanding the impact of IT solutions.

CO6 is partially related to PO5 as knowing information about different databases may not be directly aligned with understanding the societal and environmental impact of IT solutions.

CO7 is moderately related to PO5 as understanding database integrity and security concepts is a specific aspect within the broader skills needed to understand the impact of IT solutions.

6. **PO1 with all CO's :**

CO1 is moderately related to PO6 as developing the database design by normalization contributes to general database proficiency, which is a part of the broader practice of computing.

CO2 is moderately related to PO6 as knowing functional dependencies and designing relational databases is a specific skill within the broader proficiency in the practice of computing.

CO3 is moderately related to PO6 as the design concept of transaction and query processing is a specific aspect within the broader proficiency in the practice of computing.

CO4 is moderately related to PO6 as analyzing the recovery system of different databases is a specific skill within the broader proficiency in the practice of computing.

CO5 is strongly related to PO6 as applying normalization concepts to real-world problems is directly connected to developing proficiency in the practice of computing.

CO6 is partially related to PO6 as knowing information about different databases is not a direct measure of proficiency in the practice of computing. Proficiency in computing involves broader skills and knowledge beyond database specifics.

CO7 is moderately related to PO6 as understanding database integrity and security concepts is a specific aspect within the broader proficiency in the practice of computing.

7. **PO1 with all CO's :**

CO1, CO2, CO3, CO4, CO5, CO6, and CO7 are strongly related to PO7 as developing the capacity to study and research independently is directly aligned with skills required for database design, understanding functional dependencies, transaction and query processing, analyzing recovery systems, applying normalization to real-world problems, acquiring knowledge about different databases, and understanding database integrity and security concepts. These skills collectively contribute to an individual's readiness for transition to employment in hardware/software companies, where a strong foundation in database management is crucial.

Class: F.Y. B. Sc. (Computer Science) (Semester-I) (2022 Pattern)

Subject: Computer Science **Paper Code: UCSCO123**
Title of Paper: Advanced Programming Using C **Paper: I Lab Course-I**
Credit: 2 **No. of Lectures:36**

Course Outcomes:

CO1: Problem solving and programming capability and develop
CO2: Advanced as well as Graphics programming capability.
CO3: To solve real world computational problems.
CO4: To define and manage data structures based on problem subject domain.
CO5: To work with textual information, characters and strings
CO6: To Manage I/O operations in your C program.
CO7: Design and implement a 'C' programs for different problems

	Title of Experiment/ Practical
1	Assignment to demonstrate use of pointers.
2	Assignment to demonstrate concept of strings (string & pointers)
3	Assignment to demonstrate array of strings.
4	Assignment to demonstrate use of bitwise operators.
5	Assignment to demonstrate structures and unions.
6	Assignment to demonstrate structures (using array and functions).
7	Assignment to demonstrate command line arguments and pre-processor directives.
8	Assignment to demonstrate file handling (text files & binary files)
9	Assignment to demonstrate graphics programming.
10	Activity 10.1-Based on structures Activity 10.2-Based on pointers
11	Activity 11.1-Based on File handling conceptsActivity 11.-Based on Graphics

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

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

1. Justification of PO1 to ALL COs :

Justification: Developing problem-solving and programming capabilities strongly aligns with the application of fundamental principles of Computer Science to various applications.

Justification: While advanced programming capabilities are relevant, the direct connection to applying fundamental principles in a wide range of applications is moderately related.

Justification: Solving real-world computational problems directly aligns with applying fundamental principles and methods to a wide range of applications.

Justification: Defining and managing data structures based on the problem subject domain is integral to applying fundamental principles in various Computer Science applications.

Justification: Working with textual information is relevant, but its direct application to a wide range of applications is moderately related.

Justification: Managing I/O operations is essential, but its direct connection to the application of fundamental principles is moderately related.

Justification: Designing and implementing 'C' programs for different problems strongly aligns with applying fundamental principles to various applications.PO2: Design, correctly implement and document solutions to significant computational problems.

Justification: Developing problem-solving and programming capabilities strongly aligns with the design, correct implementation, and documentation of solutions to significant computational problems.

Justification: Advanced and graphics programming capabilities are directly related to designing and implementing solutions to significant computational problems.

Justification: Solving real-world computational problems is at the core of designing and correctly implementing solutions to significant computational problems.

Justification: Defining and managing data structures based on the problem subject domain is integral to the design and correct implementation of solutions to significant computational problems.

Justification: Working with textual information is relevant, but its direct connection to designing solutions to significant computational problems is moderately related.

Justification: Managing I/O operations is important but is moderately related to the overall design and correct implementation of solutions to significant computational problems.

Justification: Designing and implementing 'C' programs for different problems directly aligns with designing, correctly implementing, and documenting solutions to significant computational problems.

Justification: Developing problem-solving and programming capabilities is moderately related to imparting an understanding of the basics of the discipline, as it contributes to foundational knowledge.

Justification: Advanced and graphics programming capabilities are moderately related to the basics of the discipline, as they build upon foundational programming concepts.

Justification: Solving real-world computational problems is moderately related to imparting an understanding of the basics of the discipline, as it involves applying fundamental principles.

Justification: Defining and managing data structures is strongly related to imparting an understanding of the basics of the discipline, as it involves fundamental concepts in computer science.

Justification: Working with textual information is moderately related to the basics of the discipline, as it involves foundational concepts of data manipulation.

Justification: Managing I/O operations is moderately related to imparting an understanding of the basics of the discipline, as it involves fundamental concepts in programming.

Justification: Designing and implementing 'C' programs is moderately related to the basics of the discipline, as it involves applying fundamental principles to solve problems.

Justification: Developing problem-solving and programming capabilities is moderately related to preparing for continued professional development, as it provides a foundational skillset.

Justification: Advanced and graphics programming capabilities are moderately related to continued professional development, as they contribute to a deeper and specialized skill set.
Justification: Solving real-world computational problems is moderately related to preparing for continued professional development, as it demonstrates practical problem-solving skills.
Justification: Defining and managing data structures strongly relates to preparing for continued professional development, as it involves core skills essential for a career in computer science.
Justification: Working with textual information is moderately related to preparing for continued professional development, as it involves foundational skills in data manipulation.
Justification: Managing I/O operations is partially related to preparing for continued professional development, as it is a fundamental skill but may not directly contribute to the broader aspects of professional development.
Justification: Designing and implementing 'C' programs strongly relates to preparing for continued professional development, as it involves practical application of programming skills.
Justification: Problem-solving and programming capability, while essential, may only partially relate to understanding the societal and environmental impact of IT solutions.
Justification: Advanced and graphics programming capabilities may only partially relate to understanding the societal and environmental impact of IT solutions.
ustification: Solving real-world computational problems is moderately related to understanding the societal and environmental impact of IT solutions, as it involves practical problem-solving skills.
Justification: Defining and managing data structures is moderately related to understanding the societal and environmental impact of IT solutions, as it involves considerations for efficient and sustainable data management.
Justification: Working with textual information is moderately related to understanding the societal and environmental impact of IT solutions, as it involves considerations for handling information.
Justification: Managing I/O operations, while important, may only partially relate to understanding the societal and environmental impact of IT solutions.
Justification: Designing and implementing 'C' programs is moderately related to understanding the societal and environmental impact of IT solutions, as it involves practical application of programming skills that can influence sustainability.
Justification: Developing problem-solving and programming capabilities strongly relates to developing proficiency in the practice of computing.
Justification: Advanced and graphics programming capabilities strongly relate to developing proficiency in the practice of computing, as they contribute to a higher level of expertise.
Justification: Solving real-world computational problems strongly relates to developing proficiency in the practice of computing, as it involves applying theoretical knowledge to practical scenarios.
Justification: Defining and managing data structures strongly relates to developing proficiency in the practice of computing, as it involves core skills in organizing and manipulating data.
Justification: Working with textual information moderately relates to developing proficiency in the practice of computing, as it involves foundational skills in handling information.
Justification: Managing I/O operations moderately relates to developing proficiency in the practice of computing, as it involves essential skills in handling input and output.
Justification: Designing and implementing 'C' programs strongly relates to developing proficiency in the practice of computing, as it involves practical application of programming skills.
Justification: Developing problem-solving and programming capabilities strongly relates to developing the capacity to study and research independently for a successful transition to employment.
Justification: Advanced and graphics programming capabilities strongly relate to the capacity for independent study and research, enhancing the skills needed for employment in hardware/software companies.

Justification: Solving real-world computational problems strongly relates to the capacity for independent study and research, providing practical skills for transition to employment.
Justification: Defining and managing data structures strongly relates to the capacity for independent study and research, crucial for success in hardware/software companies.
Justification: Working with textual information moderately relates to the capacity for independent study and research, contributing to foundational skills needed for employment.
Justification: Managing I/O operations moderately relates to the capacity for independent study and research, as it involves practical skills relevant to hardware/software employment.
Justification: Designing and implementing 'C' programs strongly relates to the capacity for independent study and research, showcasing practical skills applicable to employment in hardware/software companies.

Class: F.Y. B. Sc. (Comp. Sci.) (2022 Patter) (Semester- II)

Subject: Computer Science **Paper Code:** UCSCO124

Title of Paper: Lab Course on DBMS-II **Paper:** IV

Credit: 2 **No. of Practical's:** 12

Course 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 RDBMS concepts.
- Understand creations, manipulation and querying of data in databases.

Course Outcomes:

CO1. Outline the fundamental concepts of relational Database Management System.

CO2. Perform advanced Relational database Management Operations.

CO3. Validate the queries by implementing error and exception handling techniques.

CO4. Write queries, functions, triggers, cursor, and views using SQL and PL/SQL.

CO5. Understand the advanced database concepts and database management system.

CO6. To solve real world computational problems.

CO7. Understand data base management system.

Sr. No.	Title of Experiment/ Practical
1.	Simple Queries
2.	Nested Queries, using aggregate functions
3.	Queries using Views
4.	Stored Function
5.	Cursors
6.	Exception Handling
7.	Triggers
8.	Activity -1 (ER, & Normalization)
9.	Activity -2 (ER, & Normalization)
10.	Case Studies (2)

Mapping of this course with Programme Outcomes

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

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

Justification of PO with CO:

1. **PO1 with all CO's :**

   CO1 is strongly related to PO1 as it involves outlining the fundamental concepts of a Relational Database Management System (RDBMS), which aligns with applying fundamental principles and methods of Computer Science.

   CO2 is moderately related to PO1 as performing advanced Relational Database Management Operations is a specific application of the fundamental principles and methods of Computer Science.

   CO3 is moderately related to PO1 as validating queries with error and exception handling involves the application of fundamental concepts in a specific context within a database management system.

   CO4 is strongly related to PO1 as writing queries, functions, triggers, cursor, and views using SQL and PL/SQL directly aligns with applying fundamental principles and methods of Computer Science.

   CO5 is moderately related to PO1 as understanding advanced database concepts and database management systems builds on the fundamental concepts outlined in CO1.

   CO6 is moderately related to PO1 as solving real-world computational problems is an application of fundamental principles, but it may not specifically involve database management.

   CO7 is strongly related to PO1 as understanding a database management system is a fundamental concept within the broader scope of applying principles and methods of Computer Science.

2. **PO1 with all CO's :**

   CO1 is moderately related to PO2 as outlining the fundamental concepts of a relational Database Management System (DBMS) is foundational but doesn't directly address designing and implementing solutions to computational problems.

   CO2 is strongly related to PO2 as performing advanced Relational Database Management Operations is a direct application of designing, implementing, and documenting solutions to computational problems.

CO3 is moderately related to PO2 as validating queries by implementing error and exception handling techniques is part of the broader process of designing and implementing solutions but is more focused on query validation.

CO4 is strongly related to PO2 as writing queries, functions, triggers, cursor, and views using SQL and PL/SQL is a practical skill directly related to designing and implementing solutions to computational problems.

CO5 is moderately related to PO2 as understanding advanced database concepts and database management system contributes to the overall knowledge but may not directly involve the design and implementation of computational solutions.

CO6 is strongly related to PO2 as solving real-world computational problems is the essence of designing, implementing, and documenting solutions to significant computational problems.

CO7 is moderately related to PO2 as understanding database management systems contributes to the overall knowledge but may not directly involve the hands-on process of designing and implementing solutions to computational problems.

3. **PO1 with all CO's :**

CO1 is strongly related to PO3 as outlining the fundamental concepts of a relational Database Management System (DBMS) is fundamental to imparting an understanding of the basics of the discipline.

CO2 is moderately related to PO3 as performing advanced Relational Database Management Operations is part of the practical knowledge that contributes to understanding the basics, but it may not cover the entire spectrum.

CO3 is moderately related to PO3 as validating queries by implementing error and exception handling techniques contributes to practical knowledge, but it may not be considered a fundamental concept.

CO4 is strongly related to PO3 as writing queries, functions, triggers, cursor, and views using SQL and PL/SQL is a practical skill that directly contributes to understanding the basics of the discipline.

CO5 is moderately related to PO3 as understanding advanced database concepts and database management system contributes to the overall knowledge but may not directly address the basics.

CO6 is strongly related to PO3 as solving real-world computational problems is a practical application that contributes to understanding the basics of the discipline.

CO7 is moderately related to PO3 as understanding database management systems contributes to the overall knowledge but may not directly involve imparting the basics of the discipline.

4. **PO1 with all CO's :**

   CO1 is moderately related to PO4 as outlining the fundamental concepts of a relational Database Management System (DBMS) contributes to professional development but may not directly involve preparation for continued professional development.

   CO2 is moderately related to PO4 as performing advanced Relational Database Management Operations contributes to practical knowledge but may not directly involve preparation for continued professional development.

   CO3 is moderately related to PO4 as validating queries by implementing error and exception handling techniques contributes to practical skills but may not directly involve preparation for continued professional development.

   CO4 is strongly related to PO4 as writing queries, functions, triggers, cursor, and views using SQL and PL/SQL is a practical skill that directly contributes to the preparation for continued professional development.

   CO5 is moderately related to PO4 as understanding advanced database concepts and database management system contributes to overall knowledge but may not be a direct preparation for continued professional development.

   CO6 is strongly related to PO4 as solving real-world computational problems is a practical application that contributes to the preparation for continued professional development.

   CO7 is moderately related to PO4 as understanding database management systems contributes to overall knowledge but may not be a direct preparation for continued professional development.

5. **PO1 with all CO's :**

   CO1 is moderately related to PO5 as outlining the fundamental concepts of a relational Database Management System (DBMS) may not directly address the societal and environmental impact of IT analyst solutions.

   CO2 is moderately related to PO5 as performing advanced Relational Database Management Operations may not directly contribute to understanding the impact of IT analyst solutions in societal and environmental contexts.

   CO3 is moderately related to PO5 as validating queries by implementing error and exception handling techniques may not directly address the societal and environmental impact of IT analyst solutions.

   CO4 is moderately related to PO5 as writing queries, functions, triggers, cursor, and views using SQL and PL/SQL may not directly contribute to understanding the impact of IT analyst solutions in societal and environmental contexts.

   CO5 is strongly related to PO5 as understanding advanced database concepts and database management systems is essential for comprehending the impact of IT analyst solutions in societal and environmental contexts.

   CO6 is strongly related to PO5 as solving real-world computational problems is likely to involve considerations of societal and environmental impact, contributing to the understanding of sustainable development.

   CO7 is moderately related to PO5 as understanding database management systems may not directly address the societal and environmental impact of IT analyst solutions but could provide context for related considerations.

6. **PO1 with all CO's :**

   CO1 is moderately related to PO6 as outlining the fundamental concepts of a relational Database Management System (DBMS) may provide a foundation but may not directly address the proficiency in the practice of computing.

   CO2 is moderately related to PO6 as performing advanced Relational Database Management Operations may contribute to proficiency in computing, but it may not cover the broader aspects of computing practice.

   CO3 is moderately related to PO6 as validating queries with error and exception handling techniques is a specific aspect of database operations and may not cover the full spectrum of computing proficiency.

   CO4 is moderately related to PO6 as writing queries, functions, triggers, cursor, and views using SQL and PL/SQL is a specific skill related to database operations, which is a subset of computing proficiency.

   CO5 is strongly related to PO6 as understanding advanced database concepts and database management systems is an integral part of proficiency in computing.

   CO6 is strongly related to PO6 as solving real-world computational problems is a key aspect of developing proficiency in the practice of computing.

   CO7 is moderately related to PO6 as understanding database management systems is a specific area of knowledge within computing practice, but it may not cover the broader aspects of computing proficiency.

7. **PO1 with all CO's :**

   CO1 is moderately related to PO7 as outlining the fundamental concepts of a relational Database Management System (DBMS) may provide a foundational understanding but may not directly address the development of independent study and research skills for employment transition.

   CO2 is moderately related to PO7 as performing advanced Relational Database Management Operations is a specific skill within the realm of database management but may not directly contribute to the development of independent study and research skills.

   CO3 is moderately related to PO7 as validating queries with error and exception handling techniques is a specific aspect of database operations and may not cover the broader skills needed for independent study and research.

   CO4 is moderately related to PO7 as writing queries, functions, triggers, cursor, and views using SQL and PL/SQL is a specific skill related to database operations, which is a subset of the broader skills needed for independent study and research.

   CO5 is moderately related to PO7 as understanding advanced database concepts and database management systems is relevant for specific roles but may not directly address the broader skills needed for independent study and research.

   CO6 is strongly related to PO7 as solving real-world computational problems involves independent problem-solving skills, which are crucial for the development of skills needed for employment transition.

CO7 is strongly related to PO7 as understanding database management systems is a specific area of knowledge, and developing this understanding may contribute to the capacity for independent study and research in the field.