ALVA'S INSTITUTE OF ENGINEERING & TECHNOLOGY
(A Unit of Alva's Education Foundation)
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Affiliated to VTU Belagavi and Approved by AICTE, New Delhi, Recognized by Govt. of Karnataka

Department of Computer Science and Engineering

SEMESTER III

Course Code: **BCS306A** | Course Name: **OBJECT ORIENTED PROGRAMMING WITH JAVA**

Course Teacher: **Mrs. Deeksha M, Mr. Giridhar Gowda**

Course Outcomes: After studying this course, students will be able to:

CO Numbers	Course Outcomes	Blooms Level	Target Level
BCS306A.1	**Demonstrate** proficiency in writing simple programs involving branching and looping structures.	Understand (L2)	2
BCS306A.2	**Develop** a class involving data members and methods for given scenario.	Apply (L3)	2
BCS306A.3	**Apply** the concepts of inheritance and interfaces in solving real world problems.	Apply (L3)	2
CS306A.4	**Analyse** the concepts of packages and exception handling in solving complex problem.	Analyse (L4)	2
BCS306A.5	**Experiment** with the concepts of multithreading, autoboxing and enumerations in program development.	Apply (L3)	2

CO-PO/CO-PSO Mapping Matrix:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
BCS306A.1	2	1	2	1	2				1	2	2	2	2	2	2
BCS306A.2	2	2	2	1	2				1	2	2	2	2	2	2
BCS306A.3	2	2	2	1	2				1	2	2	2	2	2	2
BCS306A.4	2	2	2	2	2				1	2	2	2	2	2	2
BCS306A.5	2	1	2	1	2				1	2	2	2	2	2	2
AVG	2	2	2	1	2				1	2	2	2	2	2	2

CO-PO/CO-PSO Mapping Matrix Justification:

CO No.			Justification
BCS306A.1	PO1	2	**Basic java fundamentals**, data types, operators, class and objects in java **contributes to the enrichment of Engineering knowledge** in moderate level
	PO2	1	**Basic java fundamentals**, data types, operators, class and objects in java contributes to the **enhancement of problem analysis** in Low level.
	PO3	2	Java fundamentals, data types, operators, class and objects in java **contributes** to **the design and development** in moderate level.
	PO4	1	Basic java programming fundamentals ,operators in java, decision making statements, loop program **contribute to the Research based knowledge** in Low level
	PO5	2	Basic java programming fundamentals, operators in java, decision making statements, loop program **contribute to the usage of modern tools through IDE ECLIPSE AND ANDROID STUDIO** in moderate level
	PO9	1	**Basic java programming fundamentals**, operators in java, decision making statements, loop program **contribute to Individual and Teamwork** in Low level
	PO10	2	**Java programming fundamentals, operators in java, decision making** statements, loop program **contribute to communication effectively** to each other in Moderate level
	PO11	2	**Java programming fundamentals, operators in java, decision making** statements, loop program **contribute to Project management**

			in moderate level
	PO12	2	Basic Java programming skills to identify and solve the problems of changing technology using **Java fundamentals involving branching and looping in moderate level.**
	PS01	2	Basic programming skills with **branching and looping structures** in Java programming contribute to professional skills in computer programming in moderate level.
	PS02	2	**Basic java fundamentals**, data types, operators, class and objects in java contributes to the **enhancement of problem analysis** in Moderate level.
	PS03	2	Basic programming skills with **branching and looping** contribute to successful career development in moderate level
BCS306A.2	PO1	2	The concept of Designing class involving data members and methods **contributes to the enrichment of Engineering knowledge** in moderate level
	PO2	2	The concept of Designing class involving data members and methods **contributes to enhancement of Problem analysis** in moderate level.
	PO3	2	The concept of Designing class involving data members and methods **contributes** to **Design and development** method in moderate level
	PO4	1	The concept of Designing class involving data members and methods **contributes to Research and development** in low level
	PO5	2	The concept of Designing class involving data members and methods **contributes to usage of modern tools through IDE ECLIPSE AND ANDROID STUDIO** in moderate level.
	P09	1	The concept of Designing class involving data members and methods **contributes to enhancement Individual and Teamwork** low level.
	PO10	2	The concept of Designing class involving data members and methods **contributes to cultivating communication effectively in moderate level.**
	PO11	2	The concept of Designing class involving data members and methods **contributes to project management** in moderate level.
	PO12	2	The Basic Java programming skills to identify and solve the problems of changing technology using concept of **designing class involving data members and methods in moderate level.**
	PSO1	2	Basic programming skills **with designing class involving data members** and methods in Java programming contribute to professional skills in computer programming in **moderate level.**
	PSO2	2	The concept of Designing class involving data members and methods **contributes to enhancement of problem solving skill** in moderate level.
	PSO3	2	Basic programming skills with **designing class involving data members** and methods contribute to successful career development in moderate level.
BCS306A.3	PO1	2	The concept of inheritance, and interface **contributes to the enrichment of Engineering knowledge** in moderate level
	PO2	2	The concept of inheritance, and interface **contributes to enhancement of Problem analysis** in moderate level.
	PO3	2	The concept of inheritance, and interface contributes to **Design and development** method in moderate level
	PO4	1	The concept of inheritance, and interface **contributes to Research and development** in low level

	PO5	2	The concept of inheritance, and interface **contributes to usage of modern tools through IDE ECLIPSE AND ANDROID STUDIO** in moderate level.
	PO9	1	The concept of inheritance, and interface **contributes to Individual and Teamwork** low level.
	PO10	2	The concept of inheritance, and interface **contributes to communication effectively in moderate level**.
	PO11	2	The concept of inheritance, and interface **contributes to project management** in moderate level.
	PO12	2	The Basic Java programming skills to identify and solve the problems of changing technology using **concept of inheritance, and interface in moderate level.**
	PSO1	2	Basic programming skills with **concepts of inheritance, and interface** in Java programming contribute to professional skills in computer programming in **moderate level.**
	PSO2	2	The concept of inheritance, and interface **contributes to enhancement of problem solving skill** in moderate level.
	PSO3	2	Basic programming skills with **concepts of inheritance, and interface** contribute to successful career development in moderate level.
BCS306A.4	PO1	2	The concept of packages and **Exception handling, file operation programs contributes to the enrichment of Engineering knowledge** in moderate level
	PO2	2	The concept of packages and **Exception handling, file operation programs contributes to enhancement of Problem analysis** in moderate level.
	PO3	2	The concept of packages and **Exception handling, file operation programs** to **Design and development** method in moderate level
	PO4	2	The concept of packages and **Exception handling, file operation programs contributes to Research and development** in moderate level
	PO5	2	The concept of packages and **Exception handling, file operation programs contributes to usage of modern tools through IDE ECLIPSE AND ANDROID STUDIO** in moderate level.
	PO9	1	The concept of packages and **Exception handling, file operation programs contributes to enhancement Individual and Teamwork** low level.
	PO10	2	The concept of packages and **Exception handling, file operation programs contributes to cultivating communication effectively in moderate level**.
	PO11	2	The concept of packages and **Exception handling, file operation programs contributes to project management** in moderate level.
	PO12	2	The Java programming skills to identify and solve the problems of changing technology using concept of packages and **Exception handling, file operation programs in moderate level.**
	PSO1	2	Basic programming skills with **concepts of packages and Exception handling, file operation programs** in Java programming contribute to professional skills in computer programming in **moderate level.**
	PSO2	2	The concept of packages and **Exception handling, file operation programs contributes to enhancement of problem solving skill** in moderate level.
	PSO3	2	Basic programming skills with **concepts of packages and Exception handling, file operation programs** contribute to successful career development in moderate level.

BCS306A.5	PO1	2	The concept of multithreading, autoboxing and enumerations **contributes to the enrichment of Engineering knowledge** in moderate level
	PO2	1	The concept of multithreading, autoboxing and enumerations **contributes to enhancement of Problem analysis** in low level.
	PO3	2	The concept of multithreading, autoboxing and enumerations contribute to **Design and development** method in moderate level
	PO4	1	The concept of multithreading, autoboxing and enumerations **contributes to Research and development** in low level
	PO5	2	The concept of multithreading, autoboxing and enumerations **contributes to usage of modern tools through IDE ECLIPSE AND ANDROID STUDIO** in moderate level.
	PO9	1	The concept of multithreading, autoboxing and enumerations **contributes to Individual and Teamwork** low level.
	PO10	2	The concept of multithreading, autoboxing and enumerations **contributes to communication effectively in moderate level**.
	PO11	2	The concept of multithreading, autoboxing and enumerations **contributes to project management** in moderate level.
	PO12	2	The Java programming skills to identify and solve the problems of changing technology using concept of **multithreading, autoboxing and enumerations in moderate level.**
	PSO1	2	Basic programming skills with **concepts of multithreading, autoboxing and enumerations** in Java programming contribute to professional skills in computer programming in **moderate level.**
	PSO2	2	The concept **of multithreading, autoboxing and enumerations contributes to enhancement of problem solving skill** in moderate level.
	PSO3	2	Basic programming skills with **concepts of multithreading, autoboxing and enumerations** contribute to successful career development in moderate level.

Course Teacher
Signature with date

IQAC Member
Signature with date

25/10/23
IQAC Chairman
Signature with date

SEMESTER - III

Course Code: **BCS303** | Course Name: **OPERATING SYSTEMS**

Course Teacher: **Mrs.Vidya and Mr.H. Harshavardhan**

Course Outcomes: After studying this course, students will be able to,

CO Numbers	Course Outcomes	Blooms Level	Target Level
BCS303.1	**Relate** the fundamentals of OS, operating system structures, operating system services.	L2(Understand)	2
BCS303.2	**Apply** appropriate process scheduling concepts, algorithms, and multithreaded programming techniques for the given problem.	L3(Apply)	2
BCS303.3	**Apply** the various techniques for process synchronization and deadlock handling.	L3(Apply)	2
BCS303.4	**Apply** the various techniques for memory management.	L3(Apply)	2
BCS303.5	**Explain** and **develop** a program on file,secondary storage management strategies, and information protection mechanisms.	L2(Understand) and L3(Apply)	2

CO-PO/PSO Mapping Matrix:

CO Numbers	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
BCS303.1	2	1							1			2	2	2	2
BCS303.2	2	2	2	2	1				2			2	2	2	2
BCS303.3	2	2	2	2	1				2			2	2	2	2
BCS303.4	2	2	2	2	1				2			2	2	2	2
BCS303.5	2	2	2	2	1				2			2	2	2	2
AVG.	2	1.8	2	2	1				1.8			2	2	2	2

CO	POs	Level	Justification
BCS303.1	PO1	2	The student should be able to moderately relate the fundamentals of Operating Systems and process
	PO2	1	The student have basic knowledge to identify the basic process management concepts and issues.
	PO9	1	Function effectively as an individual and as a member or leader to understand the concept of OS andprocessmanagement.
	PO12	2	It engages students in the process of lifelong learning.
	PSO1	2	This will develop the professional skills of a student.
	PSO2	2	Students will have the ability to solve real world problems on operating system

	PSO3	2	This will develop a moderate level skills needed to pursue carrier in IT Sector
BCS303.2	PO1	2	The student should be able to moderately apply the techniques of processing scheduling and multithreaded programming.
	PO2	2	The student will be able to analyze and formulate various scheduling techniques for the given problem.
	PO3	2	The students will be able to implement the scheduling algorithms and multithreaded programming.
	PO4	2	The students will be able to interpret and apply the information regarding process scheduling and multithreaded programming.
	PO5	1	Students will be able to implement process scheduling will contribute to modern tool usage in moderate level
	PO9	2	Implementation of Process scheduling concepts and various process scheduling algorithm will contribute to individual and team work in moderate level
	PO12	2	It engages students in the process of lifelong learning.
	PSO1	2	This will enhance the professional skills of a student.
	PSO2	2	This will moderately improve the ability of students to solve real world problems.
	PSO3	2	This will develop a moderate level skills needed to pursue carrier in IT Sector
BCS303.3	PO1	2	The student should be able to moderately apply the concepts of process synchronization and deadlock.
	PO2	2	The student should be able to analyse the process synchronization and deadlock techniques.
	PO3	2	The students will be able to implement the process synchronization and deadlock techniques.
	PO4	2	The students will be able to interpret and understand the deadlock situation.
	PO5	1	Students will be able to implement appropriate algorithms for process synchronization and deadlock technique using modern tools.
	PO9	2	Students will be able to apply appropriate algorithms for deadlock and memory management.
	PO12	2	It engages students in the process of life long learning.
	PSO1	2	This will improve the professional skills of a student.
	PSO2	2	This will moderately improve the ability of students to solve real world problems.
	PSO3	2	This will develop basic level skills needed to pursue carrier in IT Sector
BCS303.4	PO1	2	The student should be able to moderately understand the fundamentals of virtual memory.
	PO2	2	The student should be able to understand the various techniques of handling virtual memory.
	PO3	2	implementation of virtual memory and to understand the concept of virtual memory.
	PO4	2	The student will be learning about different memory

			management strategies and the differences between them.
	PO5	1	The different virtual machines using VMWARE, DOS-BOX will be studied by the students.
	PO9	2	Knowledge of different types of virtual machines will contribute to individual and team work in moderate level
	PS01	2	This will develop the professional skills of a student.
	PSO2	2	This will improve the ability of students to solve real world problems.
	PSO3	2	This will develop basic level skills needed to pursue carrier in IT Sector
BCS303.5	PO1	2	The student should be able to moderately understand the concepts file,secondary storage management strategies and information protection mechanisms
	PO2	2	Student will be able to analyse file,secondary storage management strategies and information protection mechanisms
	PO3	2	Student will be able to develop programs file system
	PO4	2	Student will be able to moderately interpret file, secondary storage management strategies and information protection mechanisms
	PO5	1	Student will be able to implement various disk scheduling algorithms and files using modern tool in moderate level
	PO9	2	Students will be able to apply appropriate algorithms for files and secondary storage structure and protection
	PO12	2	It engages students in the process of lifelong learning.
	PSO1	2	This will improve the professional skills of a student.
	PSO2	2	This will improve the ability of students to solve real world problems.
	PSO3	2	This will develop basic level skills needed to pursue carrier in IT Sector

Course Teacher
Signature with date
07/11/23

08/11/2023
IQAC Member
Signature with date

IQAC Chairman
Signature with date

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***Department of Computer Science and Engineering**

SEMESTER IV

Course Code: **BCS402** | Course Name: **MICROCONTROLLERS**

Course Teacher(s): **Mr. Kiran B V & Mr. Abhijith L Kotian**

Course Outcomes: After studying this course, students will be able to:

CO Numbers	Course Outcomes	Blooms Level	Target Level
BCS402.1	**Explain** the ARM Architectural features and Instructions. **Develop** simple assembly language programs(ALP).	**Applying (L3)**	2.1
BCS402.2	**Develop** programs using ARM instruction set for an ARM Microcontroller.	**Applying (L3)**	2.1
BCS402.3	**Identify** C-Compiler Optimizations and portability issues in ARM Microcontroller.	**Applying (L3)**	2.1
BCS402.4	**Apply** the concepts of Exceptions and Interrupt handling mechanisms in developing applications.	**Applying (L3)**	2.1
BCS402.5	**Organize** the role of Cache management and Firmware in Microcontrollers.	**Applying (L3)**	2.1

CO-PO/CO-PSO Mapping Matrix:

CO Numbers	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
BCS402.1	3	2	2	1					1		1	1	2	1	1
BCS402.2	3	2	3	2	2				2		1	2	2	2	1
BCS402.3	3	3	3	2	2				2		1	2	2	2	1
BCS402.4	2	2	2	1					2		1	2	2	2	1
BCS402.5	2	2	1	1					1		1	2	2	1	1
TOTAL	13	11	11	7	4				8		5	9	10	8	5
AVERAGE	2.6	2.2	2.2	1.4	0.8				1.6		1.0	1.8	2	1.6	1

STUDENT SHOULD HAVE

CO	POs	Level	Justification
BCS402.1	PO1	3	Applying strongly the **engineering fundamentals** to study the ARM Architectural features and Instructions.
	PO2	2	**Identify** the ARM Design Philosophy, Embedded System Hardware in moderately.
	PO3	2	Moderately **design system components** using the RISC design philosophy processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

	PO4	1	Low level **Analysis and interpretation of data, and synthesis of the information** using Embedded System Software.
	PO9	1	Slightly discussing Function effectively as an **individual** able to design ARM Embedded Systems.
	PO11	1	Mapped as students will be able to think of some application circuit using ARM processor in low level.
	PO12	1	Mapped as students can able **to apply** the concepts of embedded software in low level.
	PSO1	2	Basic concepts of ARM Embedded Systems contribute to the enhancement of professional skills in understanding ARM systems in moderate level.
	PSO2	1	Understanding the fundamental concepts of registers, Current Program Status Register. will slightly enhance the problem solving skills.
	PSO3	1	Conducive in cultivating skills in RISC design for successful career development slightly.
BCS402.2	PO1	3	Applying strongly the **engineering fundamentals** to develop ARM programs using ARM instructions.
	PO2	2	**Identify** the real time problems and write programs for Embedded System Hardware in moderately.
	PO3	3	Strongly **design the programs** that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
	PO4	2	Moderate level **Analysis and interpretation of data, and synthesis of the information** using Embedded System Software.
	PO5	2	Moderately apply appropriate modern tools (Keil uvision4) to synthesize the embedded system problems.

	PO9	2	Function effectively as **an individual** ,and as a member or leader to study the computer system moderately its achieved by giving assignments.
	PO11	1	Mapped as students will be able to think of some **application programs** using arm keil software concepts in low level.
	PO12	2	Moderately mapped as students can able to analyze the concepts learnt of embedded systems using keil in continuing **professional development** and new developments.
	PSO1	2	Basic concepts of ARM Embedded Systems contribute to the enhancement of professional skills in ARM instructions in moderate level.
	PSO2	2	Understanding the ARM instruction set, Current Program Status Register. will moderately enhance the problem solving skills.
	PSO3	1	Conducive in cultivating skills in ARM programming for successful career development slightly.
BCS402.3	PO1	3	**Strong** knowledge on Basic C Data Types.
	PO2	3	Strongly Identify and analyse C Looping Structures to solve the real time tasks.
	PO3	3	Solve simple problems my using Register Allocation, Function Calls in high level.
	PO4	2	Moderate level **Analysis and interpretation of data, and synthesis of the information** using Embedded System Software.
	PO5	2	Moderately apply appropriate modern tools (Keil uvision4) to synthesize the embedded system problems using C programming skills.

	PO9	2	Moderately discussing Function effectively as an **individual** able to design ARM Embedded Systems using C programming.
	PO11	1	Mapped as students will be able to think of some **application programs** using arm keil software in C programming concepts in low level.
	PO12	2	Mapped as students can able **to apply** the concepts of embedded software in low level for life long learning.
	PSO1	2	Basic concepts of C for ARM Embedded Systems contribute to the enhancement of professional skills in ARM instructions in moderate level.
	PSO2	2	Understanding the Embedded C concepts, C Register allocation. will moderately enhance the problem solving skills.
	PSO3	1	Conducive in cultivating skills in embedded C programming for successful career development slightly.
BCS402.4	PO1	2	**Moderate** knowledge on exceptions and interrupt handling in ARM processor.
	PO2	2	Moderately Identify and analyse ARM processor exceptions and modes, vector table to solve the real time tasks.
	PO3	2	Solve simple problems by understanding exception priorities, link register offsets, interrupts, assigning interrupts in moderate level.
	PO4	1	Low level **Analysis and interpretation of data, and synthesis of the information** using Exception handling, ARM processor exceptions and modes.
	PO9	2	Moderately discussing Function effectively as an **individual** able to design ARM Embedded Systems by handling exceptions and interrupts..

	PO11	1	Mapped as students will be able to think of some **application programs** using exceptions and interrupts concepts in low level.
	PO12	2	Moderately mapped as students can able to analyze the concepts learnt of embedded systems using keil in continuing **professional development** and new developments.
	PSO1	2	Basic concepts of exceptions and interrupts and contribute to the enhancement of professional skills in ARM instructions in moderate level.
	PSO2	2	Understanding the Exception handling, ARM processor exceptions and modes, vector table, exception priorities, link register offsets, interrupts, assigning interrupts will moderately enhance the problem solving skills.
	PSO3	1	Conducive in cultivating skills in Exception handling and interrupts, assigning interrupts for successful career development slightly.
BCS402.5	PO1	2	**Moderate** knowledge on The Memory Hierarchy and Cache Memory in ARM processor.
	PO2	2	Moderately Identify and analyse ARM processor Caches and Memory Management Units to solve the real time tasks.
	PO3	1	Solve simple problems by Basic Operation of a Cache Controller in low level.
	PO4	1	Low level **Analysis and interpretation of data, and synthesis of the information** about cache Architecture: Basic Architecture of a Cache Memory, Basic Operation of a Cache Controller, The Relationship between Cache and Main Memory.
	PO5	1	
	PO9	1	Slightly discussing Function effectively as an **individual** able to understand Write Policy—Writeback or Writethrough, Cache Line Replacement Policies, Allocation Policy on a Cache Miss.
	PO11	1	Mapped as students will be able to think of some **application programs** using Cache memory and Cache policy in low level.
	PO12	2	Moderately mapped as students can able to analyze the

			concepts of cache memory for **professional development** and new developments.
	PSO1	2	Basic concepts of Cache and it's policies and contribute to the enhancement of professional skills in ARM instructions in moderate level.
	PSO2	1	Understanding the Cache and cache policies will slightly enhance the problem solving skills.
	PSO3	1	Conducive in cultivating skills in memory management slightly.

20/5

Course Teacher
Signature with date

25/05/24

IQAC Member
Signature with date

IQAC Chairman
Signature with date

SEMESTER - IV

Course Code: **BCS403** | Course Name: **DATABASE MANAGEMENT SYSTEM**

Course Teacher: **Mrs.Vidya and Mr.Prashanth Kumar**

Course Outcomes: After studying this course, students will be able to,

CO Numbers	Course Outcomes	Blooms Level	Target Level
BCS403.1	**Explain** Introduction, Overview of Database Languages, ER diagrams, Architectures and **Construct** the MySQL table for an EMPLOYEE to perform basic operations.	L2(Understanding) L3(Apply)	2.1
BCS403.2	**Apply** and **Design** the concept of Relational Algebra, Relational Models Schema with constraints and Transfer the Conceptual design into Logical Design and Perform all operations on the EMPLOYEE table.	L3(Apply) L4(Analyze)	2.1
BCS403.3	**Analyse** the various Normalization forms and **Apply** Trigger on CUSTOMER table and perform CRUD operations.	L4(Analyze)	2.1
BCS403.4	**Apply** simple and advanced SQL statements for database manipulation, Transaction Processing, cursor and perform different functional operations for EMPLOYEE table. **Develop** PL/SQL code for demonstrating usage of cursor	L3(Apply) L4(Analyze)	2.1
BCS403.5	**Apply** various techniques for Concurrency Control in databases and **Develop** NoSQL database to perform CRUD operations using MongoDB.	L3(Apply)	2.1

CO-PO/PSO Mapping Matrix:

CO Numbers	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
BCS403.1	2	2	2	1	2				2	2	2	2	3	2	2
BCS403.2	2	2	2	1	2				2	2	2	2	3	2	2
BCS403.3	2	2	2	2	2				2	1	2	2	3	3	3
BCS403.4	2	2	2	2	2				2	2	2	2	3	3	3
BCS403.5	2	2	2	1	2				2	1	1	2	3	3	3
AVG.	2	2	2	1.4	2				2	1.6	1.8	2	3	2.6	2.6

CO	POs	Level	Justification
BCS403.1	PO1	2	CO1, **Explain Introduction, Overview of Database Languages, ER diagrams, Architectures and Construct the MySQL table for an EMPLOYEE to perform basic operations** are mapped with PO1 since it contributes to the enhancement of **fundamental knowledge** in **Database Management System** in moderate level
	PO2	2	CO1, **Explain Introduction, Overview of Database Languages, ER diagrams, Architectures and Construct the MySQL table for an EMPLOYEE to perform basic operations** are mapped with PO2 since it contributes to **Problem Analysis** in **Database Management System** in moderate level
	PO3	2	CO1, **Explain Introduction, Overview of Database Languages, ER diagrams, Architectures and Construct the MySQL table for an EMPLOYEE to perform basic operations** are mapped with PO3 since it contributes to **design and development** in **Database Management System** in moderate level
	PO4	1	CO1, **Explain Introduction, Overview of Database Languages, ER diagrams, Architectures and Construct the MySQL table for an EMPLOYEE to perform basic operations** are mapped with PO4since it contributes to solving **Complex Engineering problems** in **Database Management System** in low level
	PO5	2	CO1, **Explain Introduction, Overview of Database Languages, ER diagrams, Architectures and Construct the MySQL table for an EMPLOYEE to perform basic operations** are mapped with PO5since it contributes to **Modern tool usage** such as **MySQL, MongoDB** in **Database Management System** in moderate level
	PO9	2	CO1, **Explain Introduction, Overview of Database Languages, ER diagrams, Architectures and Construct the MySQL table for an EMPLOYEE to perform basic operations** are mapped with PO9 since it contributes to **Individual and team work** in **Miniproject** in moderate level
	PO10	2	CO1, **Explain Introduction, Overview of Database Languages, ER diagrams, Architectures and Construct the MySQL table for an EMPLOYEE to perform basic operations** are mapped with PO10 since it contributes to **communication skill** demonstration of miniproject in **Database Management System** in moderate level
	PO11	2	CO1, **Explain Introduction, Overview of Database Languages, ER diagrams, Architectures and Construct the MySQL table for an EMPLOYEE to perform basic operations** are mapped with PO11since it contributes to **Project Management** through miniproject in **Database Management System** in moderate level
	PO12	2	CO1, **Explain Introduction, Overview of Database Languages, ER diagrams, Architectures and Construct the MySQL table for an EMPLOYEE to perform basic operations** are mapped with PO12since it contributes to the enhancement of **life long Learning** in moderate level
	PSO1	3	CO1, **Explain Introduction, Overview of Database Languages, ER diagrams, Architectures and Construct the MySQL table for an EMPLOYEE to perform basic operations** is mapped with PSO1 since it contributes to **Professional Skill Development** in high level
	PSO2	2	CO1, **Explain Introduction, Overview of Database Languages, ER diagrams, Architectures and Construct the MySQL table for an EMPLOYEE to perform basic operations** is mapped with PSO2 since it contributes to the enhancement **Problem Solving skill** in moderate level

	PSO3	2	CO1, **Explain Introduction, Overview of Database Languages, ER diagrams, Architectures and Construct the MySQL table for an EMPLOYEE to perform basic operations** is mapped with PSO3 since it contributes to **Successful Career and Entrepreneurship** in moderate level
BCS403.2	PO1	2	CO2,**Apply and Design the concept of Relational Algebra, Relational Models Schema with constraints and Transfer the Conceptual design into Logical Design and Perform all operations on the EMPLOYEE table** is mapped with PO1 since it contributes to the enhancement of **fundamental knowledge** in **Database Management System** in moderate level
	PO2	2	CO2, **Apply and Design the concept of Relational Algebra, Relational Models Schema with constraints and Transfer the Conceptual design into Logical Design and Perform all operations on the EMPLOYEE table** is mapped with PO2 since it contributes to **Problem Analysis** in **Database Management System** in moderate level
	PO3	2	CO2, **Apply and Design the concept of Relational Algebra, Relational Models Schema with constraints and Transfer the Conceptual design into Logical Design and Perform all operations on the EMPLOYEE table operations** is mapped with PO3 since it contributes to **design and development** in **Database Management System** in moderate level
	PO4	1	CO2, **Apply and Design the concept of Relational Algebra, Relational Models Schema with constraints and Transfer the Conceptual design into Logical Design and Perform all operations on the EMPLOYEE table operations** is mapped with PO4 since it contributes to solving **Complex Engineering problems** in **Database Management System** in low level
	PO5	2	CO2, **Apply and Design the concept of Relational Algebra, Relational Models Schema with constraints and Transfer the Conceptual design into Logical Design and Perform all operations on the EMPLOYEE table operations** is mapped with PO5 since it contributes to **Modern tool usage** such as **MySQL, MongoDB** in **Database Management System** in moderate level
	PO9	2	CO2, **Apply and Design the concept of Relational Algebra, Relational Models Schema with constraints and Transfer the Conceptual design into Logical Design and Perform all operations on the EMPLOYEE table operations** is mapped with PO9 since it contributes to **Individual and team work** in in **Miniproject** in moderate level
	PO10	2	CO2, **Apply and Design the concept of Relational Algebra, Relational Models Schema with constraints and Transfer the Conceptual design into Logical Design and Perform all operations on the EMPLOYEE table operations** is mapped with PO10 since it contributes to **communication skill by** demonstration of miniproject in **Database Management System** in moderate level
	PO11	2	CO2, **Apply and Design the concept of Relational Algebra, Relational Models Schema with constraints and Transfer the Conceptual design into Logical Design and Perform all operations on the EMPLOYEE table operations** is mapped with PO11 since it contributes to **Project Management** through miniproject in **Database Management System** in moderate level
	PO12	2	CO2, **Apply and Design the concept of Relational Algebra, Relational Models Schema with constraints and Transfer the Conceptual design into Logical Design and Perform all operations on the EMPLOYEE table operations** is mapped with PO12 since it contributes to the enhancement of **lifelong Learning** in in moderate level

	PSO1	3	CO2, **Apply and Design the concept of Relational Algebra, Relational Models Schema with constraints and Transfer the Conceptual design into Logical Design and Perform all operations on the EMPLOYEE table operations** is mapped with PSO1 since it contributes to **Professional Skill Development** in high level
	PSO2	2	CO2, **Apply and Design the concept of Relational Algebra, Relational Models Schema with constraints and Transfer the Conceptual design into Logical Design and Perform all operations on the EMPLOYEE table operations** is mapped with PSO2 since it contributes to the enhancement Problem Solving skill in moderate level
	PSO3	2	CO2, **Apply and Design the concept of Relational Algebra, Relational Models Schema with constraints and Transfer the Conceptual design into Logical Design and Perform all operations on the EMPLOYEE table operations** is mapped with PSO3 since it contributes to **Successful Career and Entrepreneurship** in moderate level
BCS403.3	PO1	2	CO3, **Analyse the various Normalization forms and Apply Trigger on CUSTOMER table and perform CRUD operations** are mapped PO1 since it contributes to the enhancement of **fundamental knowledge** in **Database Management System** in moderate level
	PO2	2	CO3, **Analyse the various Normalization forms and Apply Trigger on CUSTOMER table and perform CRUD operations** are mapped with PO2 since it contributes to **Problem Analysis** in **Database Management System** in moderate level
	PO3	2	CO3, **Analyse the various Normalization forms and Apply Trigger on CUSTOMER table and perform CRUD operations** are mapped with PO3 since it contributes to **design and development** in **Database Management System** in moderate level.
	PO4	2	CO3, **Analyse the various Normalization forms and Apply Trigger on CUSTOMER table and perform CRUD operations** are mapped with PO4since it contributes to solving **Complex Engineering problems** in **Database Management System** in moderate level
	PO5	2	CO3, **Analyse the various Normalization forms and Apply Trigger on CUSTOMER table and perform CRUD operations** are mapped with PO5 since it contributes to **Modern tool usage** such as **MySQL, MongoDB** in **Database Management System** in moderate level
	PO9	2	CO3, **Analyse the various Normalization forms and Apply Trigger on CUSTOMER table and perform CRUD operations** are mapped with PO9 since it contributes to **Individual and team work** in in **Miniproject** in moderate level
	PO10	1	CO3, **Analyse the various Normalization forms and Apply Trigger on CUSTOMER table and perform CRUD operations** is mapped with PO10 since it contributes to **communication skill through** demonstration of miniproject in **Database Management System** in low level
	PO11	2	CO3, **Analyse the various Normalization forms and Apply Trigger on CUSTOMER table and perform CRUD operations** are mapped with PO11 since it contributes to **Project Management** through miniproject in **Database Management System** in moderate level
	PO12	2	CO3, **Analyse the various Normalization forms and Apply Trigger on CUSTOMER table and perform CRUD operations** are mapped with PO12 since it contributes to the enhancement of **lifelong Learning** in in moderate level
	PSO1	3	CO3, **Analyse the various Normalization forms and Apply Trigger on CUSTOMER table and perform CRUD operations** is mapped with

			PSO1since it contributes to **Professional Skill Development** in high level
	PSO2	3	CO3, **Analyse the various Normalization forms and Apply Trigger on CUSTOMER table and perform CRUD operations** is mapped with PSO2since it contributes to the enhancement **Problem Solving skill** in high level
	PSO3	3	CO3, **Analyse the various Normalization forms and Apply Trigger on CUSTOMER table and perform CRUD operations** is mapped with PSO3 since it contributes to **Successful Career and Entrepreneurship** in high level
BCS403.4	PO1	2	CO4, **Apply simple and advanced SQL statements for database manipulation, Transaction Processing, cursor and perform different functional operations for EMPLOYEE table** is mapped with PO1 since it contributes to the enhancement of **fundamental knowledge** in **Database Management System** in moderate level
	PO2	2	CO4, **Apply simple and advanced SQL statements for database manipulation, Transaction Processing, cursor and perform different functional operations for EMPLOYEE table** is mapped with PO2 since it contributes to **Problem Analysis** in **Database Management System** in moderate level
	PO3	2	CO4, **Apply simple and advanced SQL statements for database manipulation, Transaction Processing, cursor and perform different functional operations for EMPLOYEE table** is mapped with PO3 since it contributes to **design and development** in **Database Management System** in moderate level
	PO4	2	CO4, **Apply simple and advanced SQL statements for database manipulation, Transaction Processing, cursor and perform different functional operations for EMPLOYEE table** is mapped with PO4 since it contributes to solving **Complex Engineering problems** in **Database Management System** in moderate level
	PO5	2	CO4, **Apply simple and advanced SQL statements for database manipulation, Transaction Processing, cursor and perform different functional operations for EMPLOYEE table** is mapped with PO5 since it contributes to **Modern tool usage** such as **MySQL, MongoDB** in **Database Management System** in moderate level
	PO9	2	CO4, **Apply simple and advanced SQL statements for database manipulation, Transaction Processing, cursor and perform different functional operations for EMPLOYEE table** is mapped with PO9 since it contributes to **Individual and team work** in in **Miniproject** in moderate level
	PO10	2	CO4, **Apply simple and advanced SQL statements for database manipulation, Transaction Processing, cursor and perform different functional operations for EMPLOYEE table** is mapped with PO10 since it contributes to **communication skill** demonstration of miniproject in **Database Management System** in moderate level
	PO11	2	CO4, **Apply simple and advanced SQL statements for database manipulation, Transaction Processing, cursor and perform different functional operations for EMPLOYEE table** is mapped with PO11since it contributes to **Project Management through miniproject** in **Database Management System** in moderate level
	PO12	2	CO4, **Apply simple and advanced SQL statements for database manipulation, Transaction Processing, cursor and perform different functional operations for EMPLOYEE table** is mapped with PO12 since it contributes to the enhancement of **lifelong Learning** in in moderate level

	PSO1	3	CO4, **Apply simple and advanced SQL statements for database manipulation, Transaction Processing, cursor and perform different functional operations for EMPLOYEE table** is mapped with PSO1 since it contributes to **Professional Skill Developmen**t in high level
	PSO2	3	CO4, **Apply simple and advanced SQL statements for database manipulation, Transaction Processing, cursor and perform different functional operations for EMPLOYEE table** is mapped with PSO2since it contributes to the enhancement **Problem Solving skill** in high level
	PSO3	3	CO4, **Apply simple and advanced SQL statements for database manipulation, Transaction Processing, cursor and perform different functional operations for EMPLOYEE table** is mapped with PSO3 since it contributes to **Successful Career and Entrepreneurship** in high level
BCS403.5	PO1	2	CO5, **Apply various techniques for Concurrency Control in databases and Develop NoSQL database to perform CRUD operations using MongoDB** is mapped with PO1 since it contributes to the enhancement of **fundamental knowledge** in **Database Management System** in moderate level
	PO2	2	CO5, **Apply various techniques for Concurrency Control in databases and Develop NoSQL database to perform CRUD operations using MongoDB** is mapped with PO2 since it contributes to **Problem Analysis** in **Database Management System** in moderate level
	PO3	2	CO5, **Apply various techniques for Concurrency Control in databases and Develop NoSQL database to perform CRUD operations using MongoDB table** is mapped with PO3 since it contributes to **design and development** in **Database Management System** in moderate level
	PO4	1	CO5, **Apply various techniques for Concurrency Control in databases and Develop NoSQL database to perform CRUD operations using MongoDB** is mapped with PO4 since it contributes to solving **Complex Engineering problems** in **Database Management System** in low level
	PO5	2	CO5, **Apply various techniques for Concurrency Control in databases and Develop NoSQL database to perform CRUD operations using MongoDB table** is mapped with PO5 since it contributes to **Modern tool usage** such as **MySQL, MongoDB** in **Database Management System** in moderate level
	PO9	2	CO5, **Apply various techniques for Concurrency Control in databases and Develop NoSQL database to perform CRUD operations using MongoDB** is mapped with PO9 since it contributes to **Individual and team work** in **Miniproject** in moderate level
	PO10	1	CO5, **Apply various techniques for Concurrency Control in databases and Develop NoSQL database to perform CRUD operations using MongoDB** is mapped with PO10 since it contributes to **communication skill** demonstration of miniproject in **Database Management System** in low level
	PO11	1	CO5, **Apply various techniques for Concurrency Control in databases and Develop NoSQL database to perform CRUD operations using MongoDB** are mapped with PO11 since it contributes to **Project Management through miniproject** in **Database Management System** in low level
	PO12	2	CO5, **Apply various techniques for Concurrency Control in databases and Develop NoSQL database to perform CRUD operations using MongoDB** is mapped with PO12 since it contributes to the enhancement of **lifelong Learning** in in moderate level

	PSO1	3	CO5, **Apply various techniques for Concurrency Control in databases and Develop NoSQL database to perform CRUD operations using MongoDB table** is mapped with PSO1 since it contributes to **Professional Skill Developmen**t in high level
	PSO2	3	CO5, **Apply various techniques for Concurrency Control in databases and Develop NoSQL database to perform CRUD operations using MongoDB** is mapped with PSO2since it contributes to the enhancement **Problem Solving skill** in high level
	PSO3	3	CO5, **Apply various techniques for Concurrency Control in databases and Develop NoSQL database to perform CRUD operations using MongoDB** is mapped with PSO3 since it contributes to **Successful Career and Entrepreneurship** in high level

Course Teacher
Signature with date

IQAC Member
Signature with date

IQAC Chairman
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CO PO MAPPING – Academic Year 2023-24 (ODD SEM)

SEMESTER V

Course Code: **BCS503** | Course Name: **THEORY OF COMPUTATION**

Course Teacher: **Mr. VENKATESH**

Course Outcomes: After studying this course, students will be able to:

CO Numbers	Course Outcomes	Blooms Level	Target Level
BCS503.1	**Apply** the concepts of automata theory to write DFA, NFA, Epsilon-NFA and conversion between them.	Apply (L3)	2.1
BCS503.2	**Make use of** Regular Expressions to prove the properties of regular languages.	Apply (L3)	2.1
BCS503.3	**Develop** context-free grammars (CFGs) and pushdown automata (PDAs) for formal languages.	Apply (L3)	2.1
BCS503.4	**Analyze** the Normal forms, Pumping Lemma for CFGs and Closure Properties for Context Free Languages.	Analyse (L4)	2.1
BCS503.5	**Develop** Turing machines to solve the computational problems, and discuss the concepts of decidability and undecidability.	Apply (L3)	2.1

CO-PO/CO-PSO Mapping Matrix:

CO Numbers	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
BCS503.1	2	2	3	1	2				2	1	2	1	2	2	1
BCS503.2	2	2	2	1	2				2	1	2	1	2	2	1
BCS503.3	2	2	3	1	2				2	1	2	1	2	2	1
BCS503.4	2	2	2	1	2				2	1	2	1	2	2	1
BCS503.5	2	2	3	1	2				2	1	2	1	2	2	1
AVG	2	2	2.5	1	2				2	1	2	1	2	2	1

CO-PO/CO-PSO Mapping Matrix Justification:

CO Numbers	PO	Level	Justification
BCS503.1	PO1	2	Students can understand the fundamental Concepts of Finite Automata (DFA, NFA), Formal Languages and Compilers that contributes to the enrichment of **Engineering Knowledge** in moderate level.
	PO2	2	Students can moderately analyse the NFA, DFA and Epsilon NFA.
	PO3	2	Students can get the problem solution of NFA to DFA conversion and Minimization of DFA.
	PO4	1	With the knowledge of conversion of NFA to DFA and minimization of DFA, students may try to convert more complex type of DFA to NFA and Minimize more complex DFA.
	PO9	2	Students can involve in the team work to discuss about NFA to DFA Conversion and Minimization of DFA.

		PO5	2	Working with Simulation of DFA, NFA for some problems using JFLAP Simulator will contribute to **usage of modern tools** in moderate level.
		PO9	2	Students can involve in the team work to discuss about NFA to DFA Conversion and Minimization of DFA and some assignment problems will contribute to **Individual and Team work** in moderate level.
		PO 10	1	In the group task, the students can develop the communication by discussing and / or presenting the concept of NFA to DFA conversion, Minimization of DFA with the suitable examples contribute to **Communication** in low level.
		PO 11	1	Students can demonstrate their knowledge of NFA to DFA conversion, Minimization of DFA with the suitable examples will contribute to **Project Management** in low level
		PO 12	1	Students may learn or think of the NFA to DFA conversion, Minimization of DFA will contribute to the enhancement of **Life-Long Learning Skill** in low level..
		PSO1	2	Students have ability to understand the concepts of Automata Theory contribute to the enrichment of **Professional skills in computer programming** in moderate level..
		PSO2	3	Students have ability to solve the Minimization of DFA problems, NFA to DFA Conversions which contributes to enhancement of **Problem Analysis** in high level..
		PSO 3	1	Knowledge of Minimization of DFA problems, NFA to DFA Conversions and knowledge on phases of the compilers will contribute to cultivating skills for **successful carrier Development** in Low Level.
	BCS503.2	PO1	2	Students can understand fundamental functioning of Finite Automata, Regular Expressions, and Regular Languages contributes to the enrichment of **Engineering Knowledge** in moderate level..
		PO2	2	Students can analyse the properties of Regular Expressions, Regular Languages which contributes to enhancement of **Problem Analysis** in moderate level.
		PO3	3	Students can get the solution for some problems related to regular expressions and regular languages contributes to **design and development** in high level.
		PO4	1	Knowledge on Regular Expressions and Regular Languages will contribute to conduct **investigation of complex problem** in low level.
		PO9	2	Students can do token representation and token specification using state diagram and derivation with the help of Regular Expressions as an individual task or group task contribute to **Individual and Team work** in moderate level.
		PO 10	1	In the group task, the students can present the solution for the given problem related to regular expression will contribute to **Communication** in low level .
		PO 11	1	Students can demonstrate their knowledge of Regular Expressions and Regular Definitions will contribute to **Project Management** in low level.

		PO 12	1	In the future life, the students may learn or think of recognizing and specifying the few new tokens in different languages will contribute to the enhancement of **Life-Long Learning Skill** in low level..
		PSO1	2	Knowledge on the concepts of regular expression and regular languages contribute to the enrichment of **Professional skills in computer programming** in moderate level.
		PSO2	3	Students can solve the problems related to regular expressions and regular languages which contributes to enhancement of **Problem-solving skills** in high level.
		PSO 3	1	Knowledge of regular expressions and regular languages will contribute to cultivating skills for **successful carrier Development** in Low Level.
	BCS503.3	PO1	2	Students can understand fundamental knowledge of Grammars and Push Down Automata which contributes to the enrichment of **Engineering Knowledge** in moderate level.
		PO2	2	Students can analyse different concepts of the grammars like Derivations, Parse Trees, Ambiguity, left Recursion, Left Factoring and working with pushdown automata which contributes to enhancement of **Problem Analysis** in moderate level.
		PO3	3	Students can construct the grammar for the given problem and design PDA contributes to **design and development** in High level
		PO4	1	Students can think to analyse the more complex problems of Grammars like Elimination of Ambiguity, Elimination of Left Recursion, Left Factoring the Grammar, will contribute to conduct **investigation of complex problem** in low level.
		PO5	2	PDA can be simulated using the simulator JFLAP will contribute to **usage of modern tools** in moderate level.
		PO9	2	Students can solve the problems of Grammars like Elimination of Ambiguity, Elimination of Left Recursion, Left Factoring the Grammar will contribute to **Individual and Team work** in moderate level
		PO 10	1	In a group activity, the students can give the presentation of the PDA for their problem will contribute to **Communication** in low level .
		PO 11	2	Students can demonstrate the PDA for their allotted problems will contribute to **Project Management** in low level
		PO 12	1	Knowledge on CFG and PDA will contribute to the enhancement of **Life-Long Learning Skill** in low level.
		PSO1	2	Students are having ability to analyse CFG and to construct the PDA contribute to the enrichment of **Professional skills in computer programming** in moderate level.
		PSO2	3	Students are having the ability to Construct the PDA for the given problem contributes to enhancement of **Problem-solving skills** in high level.
		PSO 3	1	Knowledge of CFG and PDA will contribute to cultivating skills for **successful Carrier Development** in low Level. .
	BCS503.4	PO1	2	Students can understand the fundamentals of Normal Forms, Pumping Lemma for CFGs, and Closure Properties for Context Free Languages which contributes to the enrichment of **Engineering Knowledge** in moderate level.
		PO2	2	Students can analyse the Normal Forms, Pumping Lemma for CFGs and Closure Properties for Context Free Languages which contributes to enhancement of **Problem Analysis** in moderate level.

		PO3	3	Students can solve the problems of Pumping Lemma for CFGs, and Closure Properties for Context Free Languages contributes to **design and development** in High level
		PO4	1	Students can think about some more complex problems using Pumpoing Lemma and Closure Properties will contribute to conduct **investigation of complex problem** in low level.
		PO9	2	Students can solve a given problem using Pumping Lemma and Closure Properties for Context Free Languages will contribute to **Individual and Team work** in moderate level
		PO 10	1	Students can present and demonstrate the solutions of the problems on Pumping Lemma and Closure Properties will contribute to **Communication** in low level
		PO 11	1	Students can present and demonstrate the solutions of the problems on Pumping Lemma and Closure Properties will contribute to **Project Management** in low level
		PO 12	1	In future life, students may learn to solve the problems on Pumping Lemma and Closure Properties will contribute to the enhancement of **Life-Long Learning Skill** in low level.
		PSO1	2	Students are having ability to analyse the Normal Forms, Pumping Lemma for CFGs and Closure Properties for Context Free Languages contribute to the enrichment of **Professional skills in computer programming** in moderate level.
		PSO2	3	Students are having the ability to solve the problems on Normal Forms, Pumping Lemma for CFGs and Closure Properties for Context Free Languages contributes to enhancement of **Problem-solving skills** in high level.
		PSO 3	1	Knowledge of Pumping Lemma, and Closure Propertiues will contribute to cultivating skills for **successful carrier Development** in Low Level.
	BCS503.5	PO1	2	Students can understand concept of Turing Machine, Decidability and Undecidability which contributes to the enrichment of **Engineering Knowledge** in moderate level.
		PO2	2	Students can analyse working of Turing Decidability and Undecidability which contributes to enhancement of **Problem Analysis** in moderate level.
		PO3	3	Students can develop the simple solutions for Turing Machine Problems contributes to **design and development** in High level
		PO4	1	Students can solve more complex problems on Turing Machine will contribute to conduct **investigation of complex problem** in low level.
		PO5	2	Simulation of Turing Machines using JFLAP will contribute to **usage of modern tools** in moderate level.
		PO9	2	Students can analyse the working of Turing Machine and can solve the problems using Turing Machine as an individual or group activity will contribute to **Individual and Team work** in moderate level.
		PO 10	1	In a group activity, the students can present the Working of Turing Machine and can present the solutions of the problems on Turing Machine will contribute to **Communication** in low level
		PO 11	1	Students can demonstrate working of Turing Machine will contribute to **Project Management** in low level.

	PO 12	1	In future life, the students may learn more other problem-solving using Turing Machine will contribute to the enhancement of **Life-Long Learning Skill** in low level.
	PSO1	2	Students can analyse the process of code generator contribute to the enrichment of **Professional skills in computer programming** in moderate level.
	PSO2	3	Students can solve the problems using Turing Machine contributes to enhancement of **Problem-solving skills** in high level.
	PSO 3	1	Knowledge of Turing Machine will contribute to cultivating skills for **successful carrier Development** in Low Level.

12/09/2024
Course Teacher
Signature with date

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IQAC Member
Signature with date

12/9/24
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Department of Computer Science & Engineering
SEMESTER VI

Course Code: **21CS653** | Course Name: **Introduction to Cyber security**

Course Teacher: **Prof. Deepika Kamath**

Course Outcomes: After studying this course, students will be able to:

CO Numbers	Course Outcomes	Blooms Level	Target Level
21CS653.1	**Understand** the cyber crime terminologies. **Demonstrate** legal perspective and Indian perspective of cyber crime.	Apply (L3)	2
21CS653.2	**Demonstrate** how criminals plan the attacks ,social engineering ,Cyber stalking,Botnets	Apply(L3)	2
21CS6533	**Analyze** cyber crime in mobiles and wireless devices along with the tools for Cyber crime and prevention	Apply(L3)	2
21CS653.4	**Analyze** the motive and causes for cyber crime,cyber criminals and investigators.	Apply(L3)	2
21CS653.5	**Apply** the methods for understanding criminal case, evidence collection ,preserving and recovering evidence	Apply (L3)	2

CO-PO/CO-PSO Mapping Matrix:

CO No.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21CS653.1	2	1	1	1					1	2	1	2	2	2	2
21CS653.2	2	1	1	1	1				1	2	1	2	2	2	2
21CS653.3	2	2	1	1	2				1	2	1	2	2	2	2
21CS653.4	2	2	2	2	2				1	2	1	2	2	2	2
21CS653.5	2	2	2	2	2				1	2	1	2	2	2	2
AVG	2	1.6	1.4	1.4	1.6				1	2	1	2	2	2	2

CO-PO/CO-PSO Mapping Matrix Justification: Student should have

CO	Pos	Level	Justification
21CS653.1	PO1	2	**Basic concepts** of the cyber crime terminologies, legal perspective and Indian perspective of cyber crime contributes to the **enrichment of Engineering Knowledge** in moderate level.
	PO2	1	**Basic concepts** of the cyber crime terminologies, legal perspective and Indian perspective of cyber crime contributes to the **the enhancement of Problem analysis** in low level.
	PO3	1	**Demonstration of** The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000 contributes to the **design and development** in lowlevel.
	PO4	1	**Demonstration of** The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000contributes to the **conductof investigating complex problems** in low level .

	PO9	1	**Demonstration of** The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000 contributes **individual and team work in low level .**
	PO10	2	**Demonstration of** The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000 contributes **communication** through
	PO11	1	**Demonstration of** The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000 contributes to the **project management** in low level.
	PO12	2	. **Demonstration of** The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000 contributes to the **lifelong learning skills** in moderate level.
	PSO1	2	. **Demonstration of** The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000 contributes to the **enrichment of professional skills in computer programming** in moderate level.
	PSO2	2	. **Demonstration of** The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000 contributes to the **enhancement of problem solving skills** in moderate level.
	PSO3	2	. **Demonstration of** The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000 contributes to the **cultivating skills for successful career development** in moderate level
21CS653.2	PO1	2	**Demonstration of** how criminals plan the attacks ,social engineering ,cyberstalking , Botnets contributes to the **enrichment of Engineering Knowledge** in moderate level.
	PO2	1	**Demonstration of** how criminals plan the attacks ,social engineering ,cyberstalking , Botnets contributes to the **enhancement of Problem analysis** in lowlevel .
	PO3	1	**Demonstration of** Cyber offenses, how Criminals Plan Them, How Criminals Plan the Attacks and Social Engineering, Cyber stalking, Cybercafe and Cybercrimes. Botnets **contributes to the design and development** in low level .
	PO4	1	**Demonstration of** Cyber offenses, how Criminals Plan Them, How Criminals Plan the Attacks and Social Engineering, Cyber stalking, Cybercafe and Cybercrimes. Botnets contributes to the **conduct of investigating complex problems** in low level .
	PO5	1	**Demonstration of** Attacks and Social Engineering, Cyber stalking, Cybercafe and Cybercrimes. Botnets contributes to the **usage of modern tools** through application in low level.
	PO9	1	**Demonstration of** Attacks and Social Engineering, Cyber stalking, Cybercafe and Cybercrimes. Botnets contributes to **individual and team work** in low level.
	PO10	2	**Demonstration of** Attacks and Social Engineering, Cyber stalking, Cybercafe and Cybercrimes. Botnets contributes to the **communication** through presentation in moderatelevel.
	PO11	1	**Demonstration of** Attacks and Social Engineering, Cyber stalking, Cybercafe and Cybercrimes. Botnets contributes to the **project management** in low level

	PO12	2	**Demonstration of** Attacks and Social Engineering, Cyber stalking, Cybercafe and Cybercrimes. Botnets contributes to the **lifelong learning skills** in moderate level.
	PSO1	2	**Demonstration of** Cyber offenses, how Criminals Plan Them, How Criminals Plan the Attacks and Social Engineering, Cyber stalking, Cybercafe and Cybercrimes. Botnets. contributes to the **enrichment of Engineering Knowledge** in moderate level.
	PSO2	2	**Demonstration of** Cyber offenses, how Criminals Plan Them, How Criminals Plan the Attacks and Social Engineering, Cyber stalking, Cybercafe and Cybercrimes. Botnets. Contributes to the **Enhancement of problem solving skills** in moderate level.
	PSO3	2	**Demonstration of** Cyber offenses, how Criminals Plan Them, How Criminals Plan the Attacks and Social Engineering, Cyber stalking, Cybercafe and Cybercrimes. Botnets. Contributes to the to **cultivating skills for successful career development** in moderate level
21CS653.3	PO1	2	**Analyzing** cyber crime in mobiles and wireless devices along with the tools for Cyber crime and prevention contributes to the **enrichment of Engineering Knowledge** in moderate level.
	PO2	2	**Analyzing** cyber crime in mobiles and wireless devices along with the tools for Cyber crime and prevention contributes to the **enhancement of Problem analysis** in moderate level.
	PO3	1	**Analyzing** cyber crime in mobiles and wireless devices along with the tools for Cyber crime and prevention contributes to the **design and development** in lowlevel.
	PO4	1	**Analyzing** cyber crime in mobiles and wireless devices along with the tools for Cyber crime and prevention contributes to the **conduct of investigating complex problems** in low level.
	PO5	2	**Analyzing** cyber crime in mobiles and wireless devices along with the tools for Cyber crime and prevention contributes to the **usage of modern tools** through application software in moderate level.
	PO9	1	**Analyzing** cyber crime in mobiles and wireless devices along with the tools for Cyber crime and prevention contributes to **individual and teamwork** in low level
	PO10	2	**Analyzing** cyber crime in mobiles and wireless devices along with the tools for Cyber crime and prevention contributes **communication** through presentaion in moderate level.
	PO11	1	**Analyzing** cyber crime in mobiles and wireless devices along with the tools for Cyber crime and prevention to contributes to the **project management** in low level
	PO12	2	**Analyzing** cyber crime in mobiles and wireless devices along with the tools for Cyber crime and prevention contributes to the **lifelong learning skills** in moderate level.

	PSO1	2	**Analyzing** cyber crime in mobiles and wireless devices along with the tools for Cyber crime and prevention contributes to the **enrichment ofprofessional skills in computer programming** in moderate level.
	PSO2	2	**Analyzing** cyber crime in mobiles and wireless devices along with the tools for Cyber crime and prevention contributes to the **enhancement of problem solving skills** in moderate level.
	PSO3	2	**Analyzing** cyber crime in mobiles and wireless devices along with the tools for Cyber crime and prevention contributes to the **cultivating skills for successful career development** in moderate level.
21cs653.4	PO1	2	**Understanding** cyber criminals, cyber victims, cyber investigators,The Computer Investigation process, investigating computer crime. contributes to the **enrichment of Engineering Knowledge** in moderate level.
	PO2	2	**Analyzing** Cybercrime Prevention, Network Security Concepts, Basic Cryptography Concepts, Hardware and Software Security contributes to **the enhancement of Problem analysis** in moderate level.
	PO3	1	**Analyzing** Cybercrime Prevention, Network Security Concepts, Basic Cryptography Concepts, Hardware and Software Security contributes to the **design and development** in low level.
	PO4	2	**Analyzing** Cybercrime Prevention, Network Security Concepts, Basic Cryptography Concepts, Hardware and Software Security contributes to the **conduct of investigating complex problems** in moderate level.
	PO5	2	**Analyzing** Cybercrime Prevention, Network Security Concepts, Basic Cryptography Concepts, Hardware and Software Security contributes to **the usage of modern tools** through application in moderate level.
	PO9	1	**Analyzing** Cybercrime Prevention, Network Security Concepts, Basic Cryptography Concepts, Hardware and Software Security contributes to **individual and teamwork** in low level .
	PO10	2	**Analyzing** Cybercrime Prevention, Network Security Concepts, Basic Cryptography Concepts, Hardware and Software Security contributes **communication** through presentationin moderate level.
	PO11	1	**Analyzing** Cybercrime Prevention, Network Security Concepts, Basic Cryptography Concepts, Hardware and Software Security contributes **project management** in low level.
	PO12	2	**Analyzing** Cybercrime Prevention, Network Security Concepts, Basic Cryptography Concepts, Hardware and Software Security contributes to the **lifelong learningskills** in moderate level.

	PSO1	2	**Understand**ing and analyzing cyber criminals, cyber victims, cyber investigators,The Computer Investigation process, investigating computer crime. Cybercrime Prevention, Network Security Concepts, Basic Cryptography Concepts, Hardware and Software contributes to the **enrichment of professional skills in computer programming** in moderate level.
	PSO2	2	**Understand**ing and analyzing cyber criminals, cyber victims, cyber investigators,The Computer Investigation process, investigating computer crime. Cybercrime Prevention, Network Security Concepts, Basic Cryptography Concepts, Hardware and contributes **enhancement of problem solving skills** in moderate level.
	PSO3	2	**Understand**ing and analyzing cyber criminals, cyber victims, cyber investigators,The Computer Investigation process, investigating computer crime. Cybercrime Prevention, Network Security Concepts, Basic Cryptography Concepts, Hardware and contributes to the **cultivating skills for successful career development** in moderate level.
21CS653.5	PO1	2	**Analyzing and demonstrating** Cybercrime Detection Techniques,collecting digital evidence, preserving digital evidence, recovering digital evidence, documenting evidence contributes to the **enrichment of Engineering Knowledge** in moderate level.
	PO2	2	**Analyzing and demonstrating** Cybercrime Detection Techniques,collecting digital evidence, preserving digital evidence, recovering digital evidence, documenting evidence contributes to the **enhancement of Problem analysis** in modearte level
	PO3	2	**Analyzing and demonstrating** Cybercrime Detection Techniques,collecting digital evidence, preserving digital evidence, recovering digital evidence, documenting evidence contributes to the **design and development** in moderate level.
	PO5	1	**Analyzing and demonstrating** Cybercrime Detection echniques,collectingdigital evidence, preserving digital evidence, recovering digital evidence,documenting evidence contributes **to the usage of modern** tools through application software in low level.
	PO9	1	**Analyzing and demonstrating** Cybercrime Detection echniques,collectingdigital evidence, preserving digital evidence, recovering digital evidence,documenting evidence contributes.contributes to **individual and team work** in low level .
	PO10	2	**Analyzing and demonstrating** Cybercrime Detection echniques,collectingdigital evidence, preserving digital evidence, recovering digital evidence,documenting evidence contributes contributes **communication** through presentation in moderate level.
	PO11	1	**Analyzing and demonstrating** Cybercrime Detection echniques,collectingdigital evidence, preserving digital evidence, recovering digital evidence,documenting evidence contributes to the **project management** in low level.

	PO12	2	**Analyzing and demonstrating** Cybercrime Detection echniques,collectingdigital evidence, preserving digital evidence, recovering digital evidence,documenting evidence contributes to the **lifelong learning skills** in moderate level.
	PSO1	2	**Analyzing and demonstrating** Cybercrime Detection echniques,collectingdigital evidence, preserving digital evidence, recovering digital evidence,documenting evidence contributes to the **enrichment of professional skills in computer programming** in moderate level.
	PSO2	2	**Analyzing and demonstrating** Cybercrime Detection echniques,collectingdigital evidence, preserving digital evidence, recovering digital evidence,documenting evidence contributes to the **enhancement of problem solving skills** in moderate level.
	PSO3	2	**Analyzing and demonstrating** Cybercrime Detection echniques,collectingdigital evidence, preserving digital evidence, recovering digital evidence,documenting evidence contributes to the **cultivating skills for successful career development** in moderate level.

15/03/24
Course Teacher
Signature with date

15/3/24
IQAC Member
Signature with date

15/3/24
IQAC Chairman
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SEMESTER - 6

Course Code: **21CS63** | Course Name: **Computer Graphics and Image Processing**

Course Teacher: **Mr. Mahesh Kini M**

Course Outcomes: After studying this course, students will be able to:

CO Numbers	Course Outcomes	Blooms Level	Target Level
21CS63.1	**Develop** 2D graphics using suitable packages in OpenGL and **Apply** algorithm for 2D graphics using primitive and attributes.	L3	2
21CS63.2	**Apply** concepts of polygon fill area functions for 2D geometric primitives and OpenGL geometric transformation functions for 2D objects.	L3	2
21CS63.3	**Apply** concepts of line clipping algorithm and illuminations models for 2D geometric primitives and OpenGL geometric transformation functions for 3D objects.	L3	2
21CS63.4	**Understand** and **apply** Image processing functions to images to classify.	L3	2
21CS63.5	**Understand** and **apply** Image Segmentation functions to images by edge detection algorithms.	L3	2

CO-PO/CO-PSO Mapping Matrix:

CO Numbers	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
21CS63.1	2	1	1		1								2	1	
21CS63.2	2	2	1	1	1					1			2	1	
21CS63.3	2	2	1	1	1					1			2	1	
21CS63.4	3	2	1	2	1					1			2	2	
21CS63.5	2	2	2		2					1			2	2	
Average	2.2	1.8	1.2	1.3	1.2				1	1			2	1.4	

CO-PO/CO-PSO Mapping Matrix Justification:

CO Numbers	POs	Level	Justification
21CS63.1	PO1	2	Moderate knowledge on 2D and 3D graphics primitives in OpenGL.
	PO2	1	Basics analysis of line drawing and circle generation in 2D graphics
	PO3	1	Implementation of simple 2D graphics primitives and attributes.
	PO5	1	Basic tool usage for 2D graphics programs using OpenGL.
	PSO1	2	Moderate knowledge on 2D and 3D graphics primitives in OpenGL.
	PS02	1	Basics analysis of line drawing and circle generation in 2D graphics.
21CS63.2	PO1	2	Moderate knowledge on 2D graphics primitives and its transformation in OpenGL.
	PO2	2	Moderate analysis of area filling functions to 2D graphics primitives and its transformation in OpenGL.
	PO3	1	Implementation of area filling for basic 2D graphics primitives.
	PO4	1	Analysing basic transformations of 2D graphics using knowledge of scalars and vectors.
	PO5	1	Basic tool usage for transformation of 2D graphics programs using OpenGL.
	PO10	1	Basic presentation activity for the concepts of polygon fill area and 2D transformation functions in OpenGL.

	PSO1	2	Moderate knowledge on 2D graphics primitives and its transformation.
	PSO2	1	Simple analysis of area filling functions to 2D graphics primitives and its transformation in OpenGL.
21CS63.3	PO1	2	Moderate knowledge on 3D graphics primitives and its transformation OpenGL.
	PO2	2	Moderate analysis of line clipping algorithms to 2D graphics primitive and its 3D transformation in OpenGL.
	PO3	1	Implementation of line clipping algorithm for basic 2D graphic primitives and attributes.
	PO4	1	Analysing basic transformations of 3D graphics using knowledge 2D transformation matrix.
	PO5	1	Basic tool usage for transformation of 3D graphics programs using OpenGL.
	PO10	1	Basic presentation activity for the concepts of line clipping and 3 transformation functions in OpenGL.
	PSO1	2	Moderate knowledge on 3D graphics primitives and its transformation OpenGL.
	PSO2	1	Simple analysis of area filling functions to 2D graphics primitives and its transformation in OpenGL.
21CS63.4	PO1		Extensive knowledge of image and its properties.
	PO2		Moderate analysis of image pixels and their implications.
	PO3		Basic image processing techniques.
	PO4		Moderate analysis of image transformation with knowledge of 2D representations.
	PO5		Applying image processing functions for the simple interpretations using OpenGL/Python/OpenCV.
	P10		Basic presentation programs for image processing.
	PSO1		Moderate knowledge of image processing.
	PSO2		Moderate analysis of 2D operations on image.
21CS63.5	PO1		Moderate knowledge about the classification of image segmentation.
	PO2		Moderate analysis of detection of discontinuities.
	PO3		Design solutions for Edge detection algorithm & basic analysis.
	PO5		Applying image processing functions for the segmentation like canny algorithm Python/OpenCV.
	P09		Collaborative basic analysis of real world problems on image processing/segmentation.
	PSO1		Moderate knowledge of image segmentation.
	PSO2		Moderate analysis of curve algorithms and its application

30/5/24
Course Teacher
Signature with date

30/5/2024
IQAC Member
Signature with date

30/5/24
IQAC Chairman
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