BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING
(Approved by AICTE, New Delhi & Affiliated to Guru Gobind Singh Indraprastha University, Delhi)
(An ISO 9001:2015 Certified Institution)
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CO-PO-PSO

Mapping And Justification

ODD SEMESTER

BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING
Department of Information Technology

Subject: Object Oriented Programming **Subject Code: CIC 211**

Course Outcomes:

At the end of the course student will be able to:		Bloom Level
CIC211.1	Recall the concepts of C and Compare the procedural and object-oriented programming and gain in-depth knowledge of object oriented programming paradigm.	**L1- Remember** **L2-Understand**
CIC211.2	Apply various concepts of C++ programming skills.	**L3- Apply** **L6- Create**
CIC211.3	Examine different types of inheritance, polymorphism compile time and run time using classes.	**L3- Apply** **L4- Analyze** **L5- Evaluate**
CIC211.4	Explain the concept of generic programming, file handling & standard templates and build some real time application.	**L2-Understand** **L3-Apply** **L4 – Analyze** **L6 - Create**

CO-PO Matrices

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CIC211.1	3		1		2	-	-	-	3		2	2	2	-
CIC211.2	2	2	2		2	-	-	-	3		2	2	2	-
CIC211.3	3	2			2	-	-	-	3		2	2	2	-
CIC211.4	2	2	2		2	-	-	-	3		2	3	2	-

1=Slightly, 2=moderately, 3=substantially

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	LOW/ MEDIUM/ HIGH	Justification
CIC 211.1-PO1	3	Recall the concepts of C and Compare the procedural and object- oriented programming and gain in-depth knowledge of object-oriented programming paradigm can be used to apply the knowledge of engineering fundamentals to the solution of engineering problems.
CIC 211.1-PO3	1	Recall the concepts of C and Compare the procedural and object-oriented programming and gain in-depth knowledge of object-oriented programming paradigm is used for Designing solutions for engineering problems.
CIC 211.1-PO5	2	Recall the concepts of C and Compare the procedural and object- oriented programming and gain in-depth knowledge of object-oriented programming paradigm to select, and apply appropriate techniques, resources
CIC 211.1-PO9	3	Recall the concepts of C and Compare the procedural and object- oriented programming and gain in-depth knowledge of object-oriented programming paradigm to Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
CIC 211.1-PO11	2	Recall the concepts of C and Compare the procedural and object-oriented programming and gain in-depth knowledge of object-oriented programming paradigm to Manage projects in multidisciplinary environments.
CIC 211.1-PO12	2	Recall the concepts of C and Compare the procedural and object- oriented paradigm is used in almost all application have contribution in life-long learning.
CIC 211.1-PSO1	2	Recall the concepts of C and Compare the procedural and object- oriented paradigm is used to provide Information Technology based Solutions into the user environment through currents trends, technologies and practices.
CIC 211.2-PO1	2	Apply various concepts of C++ programming skills to the solution of engineering problems.
CIC 211.2-PO2	2	Apply various concepts of C++ programming skills to the solution of engineering problems to analyze engineering problems to arrive at substantiated conclusions.
CIC 211.2-PO3	2	Apply various concepts of C++ programming skills to design system components.
CIC 211.2-PO5	2	Apply various concepts of C++ programming skills to apply appropriate techniques, resources, and modern engineering and IT tools.
CIC 211.2-PO9	3	Apply various concepts of C++ programming skills to Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

CIC 211.2-PO11	2	Apply various concepts of C++ programming skills to apply these to one's own work, as a member and leader in a team
CIC 211.2-PO12	2	Apply various concepts of C++ programming skills to recognize the need for life-long learning in the broadest context of technological change.
CIC 211.2-PSO1	2	Apply various concepts of C++ programming skills to provide Information Technology based Solutions into the user environment through currents trends, technologies, and practices.
CIC 211.3-PO1	3	Examine different types of inheritance, polymorphism compile time and run time using classes to apply the knowledge of engineering fundamentals, and an engineering specialization to the solution of engineering problems.
CIC 211.3-PO2	2	Examine different types of inheritance, polymorphism compile time and run time using classes to design solutions for engineering problems and design system components or processes that meet the specified needs.
CIC 211.3-PO5	2	Examine different types of inheritance, polymorphism compile time and run time using classes to apply appropriate techniques, resources,
CIC 211.3-PO9	3	Examine different types of inheritance, polymorphism compile time and run time using classes to Function effectively as an individual, and as a member or leader in teams.
CIC 211.3-PO11	2	Examine different types of inheritance, polymorphism compile time and run time using classes to Demonstrate knowledge and understanding of engineering
CIC 211.3-PO12	2	Examine different types of inheritance, polymorphism compile time and run time using classes to engage in independent and life-long learning in the broadest context of technological change.
CIC 211.3-PSO1	2	Examine different types of inheritance, polymorphism compile time and run time using classes to provide Information Technology based Solutions into the user environment through currents trends, technologies, and practices.
CIC 211.4-PO1	2	Explain the concept of generic programming, file handling & standard templates and build some real time application to apply the knowledge of science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
CIC 211.4-PO2	2	Explain the concept of generic programming, file handling & standard templates and build some real time application to Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions.
CIC 211.4-PO3	2	Explain the concept of generic programming, file handling & standard templates and build some real time application to Design solutions for complex engineering problems and design system components

CIC 211.4-PO5	2	Explain the concept of generic programming, file handling & standard templates and build some real time application to select, and apply appropriate techniques, resources, and modern engineering
CIC 211.4-PO9	2	Explain the concept of generic programming, file handling & standard templates and build some real time application to Function effectively as an individual, and as a member or leader in teams
CIC 211.4-PO11	2	Explain the concept of generic programming, file handling & standard templates and build some real time application to Demonstrate knowledge and understanding of engineering and apply these to one's own work, as a member and leader in a team.
CIC 211.4-PO12	2	Explain the concept of generic programming, file handling & standard templates and build some real time application to Recognize the need for, and have the preparation and ability to engage in independent and life-long learning
CIC 211.4- PSO1	2	Explain the concept of generic programming, file handling & standard templates and build some real time application to provide Information Technology based Solutions into the user environment through currents trends, technologies, and practices.

BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING
Department of Information Technology

Subject: Data Structures **Subject Code: (CIC-209)**

Course Outcomes:

At the end of the course, student will be able to		Bloom Level(s)
CIC 209.1	To understand the difference between structured data and data structure	Understand, Apply, Create
CIC 209.2	To create common basic data structures and trees	Analyze, Create
CIC 209.3	To evaluate the knowledge of sets, heaps and graphs	Evaluate
CIC 209.4	To apply basicknowledge ofsorting and searching Algorithms and analyze the performance	Create

CO-PO Matrices

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CIC 209.1	3	2	2	2	3	-	-	-	2	2	2	3	2	3
CIC 209.2	3	2	2	2	3	-	-	-	2	2	2	3	1	3
CIC 209.3	3	2	2	2	3	-	-	-	2	2	2	3	2	3
CIC 209.4	3	2	2	2	3	-	-	-	2	2	2	3	2	3

1=low, 2=medium, 3=high

Curriculum Gaps:

Gaps identified

1. No gaps

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Low/ Medium/ High	Justifications
CIC209.1- PO1	High	Understanding both concepts and their distinctions is crucial for effectively managing and processing data in engineering and computer science.
CIC209.1- PO2	Medium	In problem analysis, the selection of appropriate data structures is crucial for designing efficient and effective solutions.
CIC209.1- PO3	Medium	Engineers can effectively design and develop solutions that leverage appropriate data structures to meet performance, efficiency, and scalability requirements.
CIC209.1- PO4	Medium	Both structured data and data structures play vital roles in the investigation of complex problems. Structured data provides the raw, organized information needed for analysis, while data structures enable efficient data processing and algorithm implementation.
CIC209.1- PO5	High	Structured data and data structures both play vital roles in modern tool usage. Structured data is essential for storing and analyzing organized information, making it compatible with various databases and BI tools.
CIC209.1- PO9	Medium	Both structured data and data structures play crucial roles in individual and team work. Structured data is essential for organizing and analyzing information, facilitating consistent and efficient data handling in both personal and collaborative contexts.
CIC209.1- PO10	Medium	Understanding both concepts allows for effective communication regarding data management, whether focusing on the organization and analysis of data (structured data) or the technical aspects of data handling and optimization (data structure)
CIC209.1- PO11	Medium	Understanding structured data aids in organizing project-related information and financial data for analysis and reporting. Data structures, on the other hand, are crucial for optimizing data processing and algorithmic tasks in finance, enhancing efficiency and decision-making capabilities.
CIC209.1- PO12	High	In lifelong learning, structured data helps learners organize and manage their learning materials and progress, while an understanding of data structures is beneficial for developers creating educational technology platforms and applications to optimize data handling and enhance learning experiences.
CIC209.2- PO1	High	Understanding these basic data structures and trees is essential for engineering knowledge, as they form the foundation for various algorithms, data storage systems, and optimization techniques used in software development, computer engineering, and system design.
CIC209.2- PO2	Medium	These common basic data structures and trees serve as fundamental tools for problem analysis, enabling engineers and analysts to model, represent, and solve a wide range of computational problems efficiently.
CIC209.2- PO3	Medium	By incorporating these common basic data structures and trees into the design and development of solutions, developers can efficiently manage and manipulate data, optimize algorithmic processes, and design scalable and robust systems.
CIC209.2- PO4	Medium	By incorporating these common basic data structures and trees into the conduct of investigations of complex problems, investigators can effectively organize, analyze, and process diverse datasets, enabling them to uncover insights, identify patterns, and derive meaningful conclusions efficiently.
CIC209.2- PO5	High	By incorporating these common basic data structures and trees into modern tool usage, developers can build robust, scalable, and efficient software solutions.
CIC209.2- PO9	Medium	In both individual and team work, these structures enable efficient data organization, manipulation, and analysis, fostering collaboration and

		facilitating the development of scalable and robust solutions to complex problems.
CIC209.2- PO10	Medium	In communication, these data structures enable efficient organization, transmission, and processing of information, enhancing clarity, and facilitating effective collaboration among individuals or groups.
CIC209.2- PO11	Medium	These data structures and trees provide the foundation for organizing and manipulating data in project management and finance, enabling efficient analysis, decision-making, and resource allocation.
CIC209.2- PO12	High	By leveraging common basic data structures and trees, lifelong learners can better organize, navigate, and optimize their learning experiences, leading to more efficient and effective knowledge acquisition and skill development.
CIC209.3- PO1	High	Sets, heaps, and graphs are indispensable tools in engineering knowledge, providing essential frameworks for organizing data, managing priorities, and modelling complex systems.
CIC209.3- PO2	Medium	Sets, heaps, and graphs are integral components of problem analysis, providing analysts with versatile frameworks for organizing data, managing priorities, and modelling complex systems. By leveraging these tools effectively, analysts can gain deeper understanding of problem domains, identify critical factors, and develop robust solutions to address a wide range of challenges in various fields and industries.
CIC209.3- PO3	Medium	Sets, heaps, and graphs serve as foundational frameworks in the design and development process, aiding designers in organizing data, prioritizing tasks, and modelling complex systems.
CIC209.3- PO4	Medium	Sets, heaps, and graphs tools effectively, investigators can gain deeper insights into the problem domain, identify critical factors, and develop innovative approaches to address complex challenges across various fields and industries.
CIC209.3- PO5	High	By leveraging these concepts effectively, modern tools can handle diverse tasks, optimize performance, and facilitate innovative solutions across a wide range of domains and industries.
CIC209.3- PO9	Medium	Sets, heaps, and graphs are integral components of both individual and team work, providing versatile frameworks for data organization, priority management, and system modelling. By leveraging these tools effectively, individuals and teams can enhance productivity, collaboration, and innovation, leading to more successful outcomes in tasks and projects across various domains and industries.
CIC209.3- PO10	Medium	Sets, heaps, and graphs are integral components of communication, providing communicators with versatile frameworks for organizing information, managing priorities, and visualizing relationships.
CIC209.3- PO11	Medium	Sets, heaps, and graphs are integral components of project management and finance, providing practitioners with versatile frameworks for organizing data, managing priorities, and modelling complex systems.
CIC209.3- PO12	High	Sets, heaps, and graphs are indispensable tools in lifelong learning, offering versatile capabilities for organizing information, prioritizing tasks, and visualizing knowledge structures.
CIC209.4- PO1	High	Sorting and searching algorithms are fundamental in engineering knowledge, enabling efficient data manipulation, optimization, and system analysis.
CIC209.4- PO2	Medium	Sorting and searching algorithms are fundamental in problem analysis, enabling analysts to efficiently manage and analyze data to gain insights and make informed decisions.
CIC209.4- PO3	Medium	Sorting and searching algorithms are fundamental in the design and development of solutions, enabling efficient data organization, resource allocation, and information retrieval.
CIC209.4- PO4	Medium	Sorting and searching algorithms are essential tools in conducting investigations of complex problems, enabling efficient data management, analysis, and information retrieval.
CIC209.4- PO5	High	Sorting and searching algorithms are essential components of modern tool usage, enabling efficient data management, organization, and

		retrieval. Performance analysis helps developers select the most suitable algorithms for specific tasks, leading to faster data processing, improved usability, and enhanced user experience in modern tools.
CIC209.4- PO9	Medium	Sorting and searching algorithms are essential tools in both individual and team work settings, enabling efficient data management and access.
CIC209.4- PO10	Medium	Sorting and searching algorithms are essential tools in communication for organizing and accessing information efficiently.
CIC209.4- PO11	Medium	By analyzing the performance of sorting and searching algorithms in project management and finance, stakeholders can make informed decisions to optimize processes, enhance efficiency, and mitigate risks.
CIC209.4- PO12	High	By analyzing the performance of sorting and searching algorithms in lifelong learning, educators and learning technology developers can design more efficient and personalized learning systems that cater to the diverse needs of learners throughout their lifelong learning journey.
CIC209.1- PSO1	Medium	Understand difference between structured data and data structure provide Information Technology based Solutions into the user environment through currents trends, technologies and practices.
CIC209.2-PSO1	Low	Creating common basic data structures and trees provide Information Technology based Solutions into the user environment through currents trends, technologies, and practices.
CIC209.3-PSO1	Medium	Knowledge of sets, heaps and graphs provide Information Technology based Solutions into the user environment through currents trends, technologies, and practices.
CIC209.4-PSO1	Medium	Basic knowledge of sorting and searching algorithms Information Technology based Solutions into the user environment through currents trends, technologies, and practices.
CIC209.1- PSO2	High	Understand difference between structured data and data structure obtain a position in Information Technology such as researcher, developer, analyst, tester and administrator in both Government and Private sector.
CIC209.2-PSO2	High	Creating common basic data structures and trees obtain a position in Information Technology such as researcher, developer, analyst, tester and administrator in both Government and Private sector.
CIC209.3-PSO2	High	Basic knowledge of sorting and searching algorithms obtain a position in Information Technology such as researcher, developer, analyst, tester and administrator in both Government and Private sector.
CIC209.4-PSO2	High	Basic knowledge of sorting and searching algorithms obtain a position in Information Technology such as researcher, developer, analyst, tester and administrator in both Government and Private sector.

BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING
Department of Information Technology

Subject: Discrete Mathematics **Subject Code: CIC 205**

Course Outcomes

At the end of the course, students will be able to:		Bloom Level
CO 1	Ability for constructing mathematical logic to solve problems	**L2-Understanding**
CO 2	Ability to Analyze/ quantify the efficiency of a developed solution (algorithm) of a computational problem	**L3-Applying** **L4-Analyzing**
CO 3	Ability to Understand mathematical preliminaries to be used in the subsequent courses of the curriculum. This includes Boolean algebra, number theory, group theory, and combinatorics.	**L2-Understanding** **L4-Analyzing**
CO 4	Ability to Understand diverse relevant topics in discrete mathematics and computation theory with an emphasis on their applicability as mathematical tools in computer science.	**L3-Applying** **L4-Analyzing**

CO-PO Matrices

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
C205.1	3	3	3	2	2	1	1	2	2	2	3	3	3	2
C205.2	3	3	3	2	2	2	3	2	2	2	3	3	2	2
C205.3	3	3	3	3	2	1	1	2	2	2	3	3	3	2
C205.4	3	3	3	3	2	2	2	2	2	2	3	3	2	2

Justification for CO-PO/PSO

C205.1-PO1	3	Mathematical logic is a foundational mathematical tool in engineering
C205.1-PO2	3	Problem formulation and analysis using mathematical logic requires in-depth analysis
C205.1-PO3	3	Mathematical logic is used to construct solution strategies in a range of domains
C205.1-PO4	2	Logical validity and limitations of constructs need investigation
C205.1-PO5	2	Tools are used in logic proof, simplification, and for exploring truth tables
C205.1-PO6	1	Indirect societal influence through building reliable systems
C205.1-PO7	1	Resource consumption has low relevance in basic logic constructs
C205.1-PO8	2	Applications of logic can involve ethical considerations (e.g., decision-making)
C205.1-PO9	2	Working on logical problem can be individual or in team based solving exercises
C205.1-PO10	2	Explaining and documenting logical solutions and proofs is required
C205.1-PO11	3	Logic is the base skill influencing boundaries of a problem in planning, but not direct project execution
C205.1-PO12	3	Evolution of logic topics makes continuous learning required
C01-PSO1	3	Logic is fundamental to IT solutions requiring reasoning and proof
C205.1-PSO2	2	Skills in logic help in problem solving in analysis, and engineering roles
C205.2-PO1	3	Quantitative analysis relies on mathematical knowledge for precise efficiency assessment
C205.2-PO2	3	The heart of this CO is detailed algorithmic efficiency analysis
C205.2-PO3	3	Efficiency directly influences design choices of effective algorithms
C205.2-PO4	2	Efficiency quantification requires investigation via experiments and datasets
C205.2-PO5	2	Tools measure and visualize efficiency data
C205.2-PO6	2	Efficiency impacts real world performance of algorithmic solutions
C205.2-PO7	3	Optimizing efficiency minimizes computation related resources
C205.2-PO8	2	Efficiency impacts decisions which can contain ethical influences
C205.2-PO9	2	Performance analysis is applied by individuals and in team performance testing
C205.2-PO10	2	Communicating analysis of efficiency is necessary
C205.2-PO11	3	Efficiency analysis impacts project management through design optimization
C205.2-PO12	3	Algorithmic efficiency analysis is a field involving continuous development
C205.2-PSO1	2	Algorithms are basis of IT solutions
C205.2-PSO2	2	Analysis skills are required in development and testing
C205.3-PO1	3	Mathematical foundations are core to engineering problems
C205.3-PO2	3	These mathematical tools aid analysis in subsequent topics
C205.3-PO3	3	Foundational mathematical tools are used to construct solution building in courses
C205.3-PO4	3	Strong analytical learning is demanded to develop fluency
C205.3-PO5	2	Calculators and applications for theory exploration are utilized
C205.3-PO6	1	The base theorems themselves are removed from direct application to societal issues
C205.3-PO7	1	Pure maths knowledge impact on sustainability is low
C205.3-PO8	2	The theorems themselves are removed from ethical discussion
C205.3-PO9	2	Individuals must master the foundations, which will allow for team application in other courses
C205.3-PO10	2	Explaining and communication of the concepts are vital in the course
C205.3-PO11	3	Foundations have minor influences in planning via understanding limitations of later projects
C205.3-PO12	3	Theoretical foundations undergo continued development
C205.3-PSO1	3	Foundational mathematical tools used in application to IT
C205.3-PSO2	2	Mathematical basics provide base required for analysis and engineering
C205.4-PO1	3	Deep understanding of concepts needed for computations
C205.4-PO2	3	Demands analysis of applications of these fields in computer science
C205.4-PO3	3	Enables effective design through applications to problems
C205.4-PO4	3	Significant investigations needed for understanding
C205.4-PO5	2	Calculation and application of computational tools needed
C205.4-PO6	2	Applications have indirect influences to society through computer application design
C205.4-PO7	2	Algorithms using concepts have influences to the environment due to efficiencies
C205.4-PO8	2	Applications to information storage systems contain ethical considerations
C205.4-PO9	2	Topics learnt must apply in teams for problem based applications
C205.4-PO10	2	Communication of techniques is required in this higher level application area
C205.4-PO11	3	Applications of topics will influence project design
C205.4-PO12	3	Field of computer science evolves quickly and requires continual learning
C205.4-PSO1	2	Diverse tools used in IT solutions in higher level courses
C205.4-PSO2	2	Roles requiring design applications use these concepts in computer application designs

BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING
Department of Information Technology

Subject code: - Computational Methods **Subject Code: ES-201**

Course Outcomes

At the end of the course, students will be able to:		**Blooms Level**
CO1	To develop mathematical models of low-level engineering problems and optimizing physical models	**Understand and Design**
CO2	To apply interpolation methods and numerical integration in real life problems.	**Apply**
CO3	To understand and solve simultaneous linear equations and curve fitting by splines.	**Understand and Analyze**
CO4	To numerically solve ordinary differential equations and analyse their application in real life initial and boundary value problems.	**Evaluate and Create**

CO-PO Matrices

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO.1	**3**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**2**	**2**	**2**	**3**	**2**	**2**
CO.2	**3**	**2**	**2**	**2**	**2**	**1**	--	--	**2**	**2**	**2**	**3**	**2**	
CO.3	**3**	**3**	**3**	**3**	**2**	**1**	--	--	**2**	**2**	**2**	**3**	**2**	
CO.4	**3**	**3**	**3**	**3**	**2**	**1**	**1**	--	**2**	**2**	**2**	**3**	**2**	**2**

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	LOW/ MEDIUM/ HIGH	Justification
ES201.1-PO1	HIGH	The concept of numerical analysis are acquired for finding the solution of complex engineering problems.
ES201.1-PO2	MEDIUM	The knowledge of numerical analysis are adopted to identify the consequential responsibilities relevant to professional engineering practices.
ES201.1-PO3	MEDIUM	The concept of numerical analysis needed in managing projects and in multidisciplinary environments.
ES201.1-PO4	HIGH	The Comprehension of numerical techniques are needed for finding the solution of complex engineering problems.
ES201.1-PO5	MEDIUM	The transform technique helps to understand the latest technologies, software tools and their limitations for modelling in complex engineering activities.
ES201.1-PO6	MEDIUM	The knowledge of equations are adopted to identify the consequential responsibilities relevant to professional engineering practices.
ES 201.1.PO7	LOW	The numerical techniques are needful for preparation and ability to engage in independent and life-long learning in the broadest context of technological change
ES 201.1.PO8	LOW	Numerical techniques are ethically used for solving problems related with real life.
ES 201.1.PO9	MEDIUM	Numerical problems are very effective to work in multidisciplinary field of engineering and sciences as individual.
ES 201.1.PO10	MEDIUM	Mathematical problems effectively apply on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations
ES 201.1.PO11	MEDIUM	The Knowledge of numerical problems are important for finding the solution of complex engineering problems which are helpful in managing projects and in Multidisciplinary environments
ES 201.1.PO12	HIGH	Numerical ways for finding solutions of equations are used for data related to environmental factors such as pollution levels, climate change, and ecological trends.
ES. 201.2-PO1	MEDIUM	The Knowledge of interpolation and integration are important for finding the solution of complex engineering problems which are helpful in projects and other Multidisciplinary environment.
ES.201.2-PO2	HIGH	Various numerical techniques are used to conduct investigations of complex engineering problems.
ES.201.2-PO3	MEDIUM	The numerical analysis technique is helpful in managing projects and in multidisciplinary environments of complex engineering problems.
ES.201.2-PO4	MEDIUM	Different techniques of numerical analysis are used in engineering field like dynamical systems, risk analysis, quality testing etc.
ES.201.2-PO5	MEDIUM	To interpret data, performing the analysis and drawing the conclusions in various research related problems, fundamental knowledge of numerical techniques are required.
ES.201.2-PO6	LOW	The knowledge of numerical techniques are adopted to identify the consequential responsibilities relevant to professional engineering practices
ES.201.2.PO9	HIGH	Numerical methods are used for designing solutions to many multidisciplinary settings.
ES.201.2.PO10	MEDIUM	Numerical analysis are used to analyse data related to environmental factors such as pollution levels, climate change, and ecological trends.
ES.201.2.PO11	MEDIUM	The numerical integration and numerical differentiation very needful for designing solutions to engineering problems and develop solutions that meet the specific needs of society.
ES.201.2.PO12	HIGH	The concept of numerical integration and numerical differentiation is very useful to understand different mathematical and engineering tools and software like MATLAB, MATHEMATICA etc.
ES.201.3.PO1	HIGH	Insight knowledge of numerical techniques is highly required to solve the system of n-linear equations related to real-life engineering problems.

ES.201.3.PO2	HIGH	The basic concept of curve fitting by splines is very important to comprehend to convert the raw/tabulated data in the form of some mathematical equations and curves.
ES.201.3.PO3	HIGH	Numerical methods play a key role in solving complex mathematical equations derived from real-life engineering phenomena.
ES.201.3.PO4	HIGH	To work in Software's like MATLAB, MATHEMATICA, ANSYS WORKBENCH, LABVIEW, etc.it is necessary to understand the terminologies of numerical methods.
ES.201.3.PO5	MEDIUM	Numerical methods are applied in various fields of engineering like chemical, mechanical marine, biomedical, electronics and communications, etc.
ES.201.3.PO6	LOW	The understanding of numerical technique is required to frame a real-life issue in the form of some mathematical equations and curves.
ES.201.3.PO9	MEDIUM	Numerical techniques are used to solve various named equations like continuity, momentum, heat transfer, electromagnetic etc.
ES.201.3.PO10	MEDIUM	Complex engineering problems related to linear equations are solved using numerical methods and are effectively applied on complex engineering activities with the engineering community and with society at large.
ES.201.3.PO11	MEDIUM	The knowledge of numerical problems is important for finding the solution of complex engineering problems which are helpful in managing projects and in Multidisciplinary environments
ES.201.3.PO12	HIGH	Numerical ways for finding solutions of linear equations and curve fitting methods are used for data related to environmental factors such as pollution levels, climate change, and ecological trends.
ES.201.3.PSO1	MEDIUM	The transform numerical technique for solving ordinary differential equations helps to understand the latest technologies, software tools and their limitations for modelling in complex engineering activities.
ES.201.4.PO1	HIGH	The understanding of numerical techniques is necessary to solve the ordinary differential equations related to real life problems.
ES.201.4.PO2	HIGH	The formulated complex real-life problems into ordinary differential equations cannot be solved analytically and hence numerical ways are implemented to find the solutions.
ES.201.4.PO3	HIGH	The Comprehensive knowledge of various numerical techniques used for obtaining numerical solutions of ordinary differential equations is important.
ES.201.4.PO4	HIGH	Various numerical results obtained after solving ordinary differential equations are used to conduct investigations of complex engineering problems.
ES.201.4.PO5	MEDIUM	Numerical analysis are used to analyse data related to health aspects such as blood flow dynamics in the different parts of human body like heart, lungs, brain, etc.
ES.201.4.PO6	LOW	The knowledge of numerical techniques are adopted for solving differential equations identifies the consequential responsibilities relevant to professional engineering practices.
ES.201.4.PO7	LOW	The numerical solutions of differential equations are needful for preparation and ability to engage in independent and life-long learning in the broadest context of technological change
ES.201.4.PO9	MEDIUM	The Knowledge of obtained numerical results of differential equations can be helpful in finding real-life solutions and Multidisciplinary environment.
ES.201.4.PO10	MEDIUM	The obtained numerical results are interpreted, analysed, and concluded in various research related problems.
ES.201.4.PO11	MEDIUM	Mathematical problems effectively apply on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations.
ES.201.4.PO12	HIGH	The initial and boundary values conditions involved in ordinary differential equation act as a constraint to model real-life problems in terms of mathematical equations.
ES.201.4.PSO1	MEDIUM	Numerical problems are very effective to work in multidisciplinary field of engineering and sciences as individual.
ES.201.4.PSO2	MEDIUM	To work in Software's like MATLAB, MATHEMATICA, ANSYS WORKBENCH, LABVIEW, etc. uses numerical methods to solve differential equations.

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Department of Information Technology

Course Name: DLCD **Course Code: ECC-207**

Course Outcomes:

At the end of the course, student will be able to		Bloom Level(s)
ECC207.1	To understand and apply Boolean algebra principles andtechniques for designing combinational circuits.	Understand, Apply, Create
ECC207.2	To design and analyse sequential circuits, such as flip-flops, counters, and shift registers.	Analyse, Create
ECC207.3	To evaluate the performance of digital circuits usinghardware for the design of a basic computer.	Evaluate
ECC207.4	To understand the design of Input-Output and MemoryOrganization of a Computer.	Create

CO-PO matrices

	PO1	PO2	PO3	PO4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	2	1	-	-	3	2	1	3	2	2
CO2	3	2	3	2	2	1	-	-	3	2	1	3	2	2
CO3	3	2	3	3	2	2	-	-	3	2	1	3	2	2
CO4	3	3	3	3	3	2	-	-	3	2	1	3	2	2

Note: Enter correlation levels 1, 2 or 3 as defined below: 1: Slight

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	LOW/MEDIUM/ HIGH	Justification
ECC 207.1-PO1	HIGH	Understanding Boolean algebra provides the foundation for logical reasoning and problem-solving skills necessary for tackling complex engineering problems
ECC 207.1-PO2	MEDIUM	Knowledge of Boolean algebra and combinational circuits enables students to analyze and solve engineering problems related to digital systems and logic design.

ECC 207.1-PO3	HIGH	Students can apply their knowledge to design system components and processes, ensuring that specifications are met while considering factors such as public health, safety, and environmental impact.
ECC 207.1-PO4	MEDIUM	Students learn to identify patterns, correlations, and anomalies in the data, which are crucial skills for conducting investigations.
ECC 207.1-PO5	MEDIUM	Understanding Boolean algebra and combinational circuits enables students to effectively utilize modern engineering tools and techniques for digital logic design and analysis.
ECC 207.1-PO6	LOW	Combinational circuits are fundamental components in digital systems used in various applications such as healthcare devices, communication systems, transportation, and consumer electronics.
ECC 207.1-PO9	HIGH	Understanding Boolean Algebra and designing combinational circuits involves both individual and teamwork.
ECC 207.1-PO10	MEDIUM	Proficiency in Boolean Algebra and combinational circuit design requires the ability to communicate effectively. Engineers must be able to articulate their ideas, design choices, and solutions clearly and concisely.
ECC 207.1-PO11	LOW	Designing combinational circuits often involves managing projects effectively, particularly in larger-scale projects where multiple circuits need to be designed, integrated, and tested within budget and time constraints.
ECC 207.1-PO12	HIGH	Boolean Algebra and combinational circuit design serve as foundational knowledge that forms the basis for lifelong learning in the field of electrical and computer engineering.
ECC 207.1-PSO1	MEDIUM	Understanding Boolean algebra and designing combinational circuits are fundamental skills in the analysis and design of digital circuits.
ECC 207.1-PSO2	MEDIUM	Understanding Boolean algebra and designing combinational circuits are foundational skills that directly contribute to the ability to identify the role of interfacing devices in communication systems.
ECC 207.2-PO1	HIGH	Understanding sequential circuits enhances students' engineering knowledge by providing insights into the design and operation of systems with memory elements, crucial for solving complex engineering problems.
ECC 207.2-PO2	MEDIUM	Knowledge of sequential circuits enables students to analyze and solve engineering problems that involve sequential logic and state transitions.
ECC 207.2-PO3	HIGH	Proficiency in sequential circuit design allows students to develop solutions for engineering problems requiring the implementation of sequential logic functions.
ECC 207.2-PO4	MEDIUM	Understanding sequential circuits enables students to conduct investigations into complex engineering problems involving sequential logic.
ECC 207.2-PO5	MEDIUM	Proficiency in sequential circuit design requires students to utilize modern engineering tools and software for simulation, verification, and synthesis.
ECC 207.2-PO6	LOW	Sequential circuits, including flip-flops, counters, and shift registers, are integral components in a wide range of digital systems used in everyday
ECC 207.2-PO9	HIGH	Designing sequential circuits often involves collaboration within multidisciplinary teams, where students work together to develop complex digital systems.

ECC 207.2-PO10	MEDIUM	Proficiency in sequential circuit design enhances students' ability to communicate effectively with the engineering community and society at large.
ECC 207.2-PO11	LOW	Designing sequential circuits requires project management skills such as task scheduling, resource allocation, and progress tracking. Students learn to manage sequential circuit design projects.
ECC 207.2-PO12	HIGH	Proficiency in sequential circuit design encourages students to engage in lifelong learning in the field of digital systems and computer engineering.
ECC 207.2-PSO1	MEDIUM	Sequential circuits play a crucial role in digital systems, enabling memory and complex functionality.
ECC 207.2-PSO2	MEDIUM	Sequential circuits play a crucial role in communication systems, particularly in signal processing and data synchronization.
ECC 207.3-PO1	HIGH	Understanding the design of a basic computer system encompasses knowledge of computer architecture, including the CPU, memory, input/output systems, and bus architecture.
ECC 207.3-PO2	MEDIUM	Designing a basic computer requires a deep understanding of system requirements, including performance specifications, functionality, and constraints.
ECC 207.3-PO3	HIGH	Understanding the design of a basic computer entails knowledge of its various components such as the CPU, memory, input/output devices, and bus architecture.
ECC 207.3-PO4	HIGH	Understanding the design of a basic computer requires students to delve into existing research, literature, and case studies in computer architecture, digital systems, and related fields.
ECC 207.3-PO5	MEDIUM	Understanding the design of a basic computer involves familiarity with various design tools and software used in computer-aided design (CAD), simulation, and modeling.
ECC 207.3-PO6	MEDIUM	Computers are foundational to numerous applications that significantly impact society, such as communication networks, financial systems, healthcare devices, and educational tools. Evaluating the performance of digital circuits ensures these systems.
ECC 207.3-PO9	MEDIUM	The design of a basic computer often requires collaboration across multiple disciplines, including computer engineering, electrical engineering, and computer science.
ECC 207.3-PO10	MEDIUM	Understanding the design of a basic computer involves the ability to effectively communicate technical concepts, design decisions, and project requirements to stakeholders, team members, and clients.
ECC 207.3-PO11	LOW	Designing a basic computer often involves project management tasks such as task scheduling, resource allocation, budget management, and risk assessment.
ECC 207.3-PO12	HIGH	Understanding the design of a basic computer is just the beginning of a lifelong learning journey in the field of computer engineering.
ECC 207.3-PSO1	MEDIUM	Understanding the design of a basic computer involves knowledge of digital circuits and systems, including processors, memory, and input/output interfaces.
ECC 207.3-PSO2	MEDIUM	Understanding the design of a basic computer involves knowledge of various components such as processors, memory, and input/output interfaces.
ECC 207.4-PO1	HIGH	Knowledge of input-output and memory organization is fundamental to understanding computer systems and their operation.

ECC 207.4-PO2	HIGH	Knowledge of input-output and memory organization enables students to analyze complex engineering problems related to computer architecture and system design.
ECC 207.4-PO3	HIGH	Proficiency in input-output and memory organization allows students to design solutions for complex engineering problems involving computer systems.
ECC 207.4-PO4	HIGH	Understanding input-output and memory organization enables students to conduct investigations into complex engineering problems related to computer architecture and system design.
ECC 207.4-PO5	HIGH	Understanding input-output and memory organization enables students to utilize modern engineering tools effectively for computer system design, analysis, and optimization.
ECC 207.4-PO6	MEDIUM	The design of input-output (I/O) systems and memory organization is crucial for the efficiency and effectiveness of computers used in various societal applications.
ECC 207.4-PO9	HIGH	Understanding input-output and memory organization fosters effective collaboration within multidisciplinary teams working on computer system design and development projects.
ECC 207.4-PO10	MEDIUM	Knowledge of input-output and memory organization allows students to communicate effectively with the engineering community and society at large.
ECC 207.4-PO11	LOW	Proficiency in input-output and memory organization is essential for managing projects involving computer system design and development.
ECC 207.4-PO12	HIGH	Understanding input-output and memory organization encourages students to engage in lifelong learning in the field of computer science and digital systems.
ECC 207.4-PSO1	MEDIUM	Input-output interfaces and memory organization are integral components of digital systems.
ECC 207.4-PSO2	MEDIUM	Input-output interfaces and memory organization are crucial aspects of communication systems, enabling data exchange between different devices and storing essential information.

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Subject: Compiler Design **Subject Code: CIC-303**

Course Outcomes

At the end of the course, student will be able to		**Bloom Level**
CIC-303.1	To describe the roles of compilers and translators, explain the structure and different phases of a compiler, and discuss the need for translators in programming.	L1 – RememberL2 – Understand
CIC-303.2	To analyze the process of lexicalanalysis, design and implement lexical analyzers, and convert regular expressions into finite automata.	L3 – Apply L4 – Analyze
CIC-303.3	To develop and evaluate top-down and bottom-up parsing techniques, including recursive-descent and LR parsers, and handle ambiguities in grammars.	L5 – EvaluateL6 – Create
CIC-303.4	To apply syntax-directed translationtechniques to generate intermediate code, use data structures for symbol tables, and implement code optimization strategies.	L3 – Apply L6 – Create

CO-PO matrices

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	-	-	2	3	-
CO2	-	3	-	-	3	-	-	-	-	2	-	-	3	2
CO3	-	-	3	3	3	2	-	-	-	-	-	-	3	3
CO4	-	3	3	-	3	-	-	-	-	-	2	-	3	3

Levels: 1=Slightly, 2=Moderately, 3=Substantially

JUSTIFICATIONS FOR CO-PO MAPPING

CO No.	PO	Level	Justification
CIC-303.1	PO1	3	Substantially applies engineering knowledge to fundamentalconcepts.
	PO12	2	Moderately recognizes the need for life-long learning.
	PSO1	3	Substantially provides IT-based solutions through understanding of compiler concepts.
CIC-303.2	PO2	3	Substantially involves problem analysis in lexical analysis.
	PO5	3	Substantially utilizes modern tools for lexical analyzers.
	PO10	2	Moderately involves communication in documenting implementations.
	PSO1	3	Substantially applies trends in lexical analysis.
	PSO2	2	Moderately prepares for developer/tester roles.
CIC-303.3	PO3	3	Substantially designs and evaluates parsing techniques.
	PO4	3	Substantially investigates parsing problems.
	PO5	3	Substantially uses modern tools for parsing.
	PO9	2	Moderately collaborates in teams.
	PSO1	3	Substantially uses advanced parsing techniques.
	PSO2	3	Substantially prepares for analyst/developer roles.
CIC-303.4	PO2	3	Substantially analyzes syntax-directed translation and optimization.
	PO3	3	Substantially designs optimized code generation.
	PO5	3	Substantially implements modern optimization techniques.
	PO11	2	Moderately involves project management.
	PSO1	3	Substantially applies code optimization techniques.
	PSO2	3	Substantially prepares for developer/tester roles in optimizationand code generation.

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Subject: Computer Network **Subject Code: CIC 307**

Course Outcomes

At the end of the course student will be able to:		Bloom Level
CIC307.1	To understand basic computer network technology.	Remember, Understand
CIC307.2	To illustrate and explain Data Communication System and its components.	Apply
CIC307.3	To compare various network topologies and IP addressing, subnetting.	Analyze
CIC307.4	To evaluate the work of OSI and TCP/IP layers.	Evalute

CO-PO matrices

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	**3**	**2**	**1**	**1**	**3**	**1**						**3**	**3**	
CO2	**3**	**2**	**1**	**1**	**3**	**1**						**3**		**3**
CO3	**3**	**2**	**1**	**1**	**3**	**1**						**3**	**3**	**2**
CO4	**3**	**2**	**1**	**1**	**3**	**1**						**3**	**2**	**3**

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Low/ Medium/ High	Justifications
CO1-PO1	H	The fundamentals of computer networking are the foundation of modern engineering knowledge.
CO1-PO2	M	Understanding the layer functions helps the students to identify and formulate the problems based on the layer.
CO1-PO3	L	Layering is base for network architecture design
CO1-PO4	L	Understanding the layer functions and understanding the network factors, helps in analysing and interpreting the quality of networks.
CO1-PO5	H	Ability to develop and compare different types of routing protocols is used to design solutions for complex engineering problems and system components
CO1-PO6	L	Ability to develop and compare different types of routing protocols
CO1-PO1	H	The necessity of fundamentals is a lesson that lasts a lifetime.
CO1-PSO1	H	Understanding the layers helps in designing applications.
CO2-PO1	H	Networking includes an understanding of network performance parameters.
CO2-PO2	M	Understanding the performance parameters helps the students to identify and formulate the problems based on the network efficiency.
CO2-PO3	L	Network performance evaluation metrics is essential for efficient network designing.
CO2-PO4	L	Understanding the performance parameters helps in analysing and interpreting the quality of networks.
CO2-PO5	H	
CO2-PO6	L	Understanding various Network protocols for computer networks is used to identify, formulate and analyze complex engineering problems.
CO2-PO12	H	Performance evaluation is base for lifelong learning.
CO2-PSO2	M	Understanding the performance metrics helps in research based works.
CO3-PO1	H	The data link layer concepts are the foundations of channel characteristics.
CO3-PO2	M	Applies the knowledge in identifying the appropriate node to node protocol for reliable communication.
CO3-PO3	L	Node to node communication of data link layer is essential for any network design.
CO3-PO4	L	Understanding the various node to node protocols helps in analysing and interpreting the quality of point to point networks.
CO3-PO5	H	Examination and evaluation of design issues in transport layer and security protocols is made possible through usage of modern IT tools with an understanding of its limitations.
CO3-PO6	L	Ability to examine and evaluate design issues in transport layer and security protocols can be applied to find solution of complex engineering problems.
CO3-PO12	H	Media access control is base for future technologies.
CO3-PSO1	H	Ability to develop and compare different types of routing protocols helps to communicate effectively on various routing protocols with the engineering community and society at large.
CO3-PSO2	M	Ability to develop and compare different types of routing protocols can be applied to find the solution of complex engineering problems.
CO4-PO1	H	To apply knowledge to a variety of applications on the network.
CO4-PO2	M	Problem analysis using scientific and mathematical methodology is highly correlated with implementation concepts.
CO4-PO3	L	Implementation literally maps to solution design of sub netting problem, thus highly correlated
CO4-PO4	L	Because implementation does not necessitate new research or detailed analysis, the justification is kept at medium.
CO4-PO5	H	Ability to examine and evaluate design issues in transport layer and security protocols is helpful in obtaining IT based position such as researcher, developer, analyst and tester
CO4-PO6	L	Understanding of Network system architecture contributes in independent and life-long learning of an individua
CO4-PO12	M	Understanding the implementation of addressing is a lifelong lesson

CO4-PSO2	H	Knowledge helps in building network management and administration applications

* 1=low, 2=medium, 3=high

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Subject: Design and Analysis of Algorithm Subject Code: CIC-311

Course Outcomes

At the end of the course student will be able to:		**Bloom's Level**
CIC311.1	To be able to analyse asymptotic runtime complexity of algorithms including formulating recurrence relations and divide and conquer designing method	L1-Remember L4-Analyze L5- Evaluate
CIC311.2	Describe the greedy paradigm and apply Greedy strategy for solving various problems	L1-Remember L3-Apply
CIC311.3	Apply dynamic programming and Branch & Bound approach to solve suitable problems	L3-Apply L4-Analyze
CIC311.4	Understand the concept of NP problems and string-matching algorithm and various flow & sorting networks	L2-Understand L4-Analyze L6-Create

CO-PO matrices

Course Outcomes (co) to Programme Outcomes (PO) mapping (scale 1: low, 2: Medium, 3: High)														
	PO01	**PO02**	**PO03**	**PO04**	**PO05**	**PO06**	**PO07**	**PO08**	**PO09**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	1	1	1	1	2	2	2	2	1	1	1	1	1
CO2	2	2	3	1	2	3	1	2	3	1	2	2	1	2
CO3	2	2	1	1	2	3	3	2	1	3	1	2	2	2
CO4	3	2	2	3	2	1	3	2	1	1	2	3	3	3

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	Low/Medium/ High	Justifications
C311.1-PO1	1	Requires mathematical and engineering fundamentals but at a basic level.
C311.1-PO2	1	Involves analyzing algorithmic efficiency but not in-depth research.
C311.1-PO3	1	Involves designing efficient solutions but not at a system level.
C311.1-PO4	1	Requires evaluating algorithm complexity but with limited research methods.
C311.1-PO5	1	Some use of modern computational tools for algorithm analysis.
C311.1-PO6	2	Efficient algorithms impact technology, which indirectly affects society.
C311.1-PO7	2	Optimization reduces computational resource consumption.
C311.1-PO8	2	Ethical considerations in algorithmic decision-making.
C311.1-PO9	2	Algorithmic problem-solving can be done individually or in teams.
C311.1-PO10	1	Requires explanation of algorithm efficiency but not detailed documentation.
C311.1-PO11	1	Algorithms affect project efficiency but are not the main focus.
C311.1-PO12	1	Algorithmic knowledge requires continuous updates.
C311.1-PSO1	1	Understanding algorithms helps in IT-based solutions.
C311.1-PSO2	1	Basic knowledge of algorithms is needed for IT jobs.
C311.2-PO1	2	Requires deeper understanding of mathematical proofs and problem-solving.
C311.2-PO2	2	Involves selecting appropriate greedy techniques based on problem analysis.
C311.2-PO3	3	Designing solutions using the greedy approach is a core aspect.
C311.2-PO4	1	Limited experimentation is required.
C311.2-PO5	2	Some tools can be used to test greedy strategies.
C311.2-PO6	3	Greedy algorithms play a major role in real-world problems like networking and scheduling.
C311.2-PO7	1	Optimization has a minor impact on resource usage.
C311.2-PO8	2	Greedy strategies must be applied ethically in decision-making scenarios.
C311.2-PO9	3	Greedy problem-solving is often done collaboratively in projects.
C311.2-PO10	1	Requires explaining strategy but not intensive documentation.
C311.2-PO11	2	Some applications in resource allocation problems.
C311.2-PO12	2	Greedy algorithms continue to evolve in research and applications
C311.2-PSO1	1	Helps in IT solutions requiring optimization.
C311.2-PSO2	2	Strongly applicable for roles like analysts and developers.
C311.3-PO1	2	Requires advanced knowledge of algorithmic strategies.
C311.3-PO2	2	Involves complex analysis to determine when to apply these approaches.
C311.3-PO3	1	Used in designing optimal solutions but not always necessary.
C311.3-PO4	1	Some research is required for choosing between DP and B&B.
C311.3-PO5	2	Requires using computational tools for large-scale problem solving.
C311.3-PO6	3	Many applications exist in transportation, finance, and security.

C311.3-PO7	3	Optimization minimizes resource usage.
C311.3-PO8	2	Ethical considerations in decision-tree algorithms.
C311.3-PO9	1	Can be worked on individually but also useful in team settings.
C311.3-PO10	3	Requires strong documentation and presentation of findings.
C311.3-PO11	1	Indirectly helps in optimizing business decisions.
C311.3-PO12	2	Continuous learning required due to evolving optimization techniques.
C311.3-PSO1	2	Useful in IT-based optimization tasks.
C311.3-PSO2	2	Crucial for positions in data analysis and software optimization.
C311.4-PO1	3	Requires strong theoretical understanding of computational complexity.
C311.4-PO2	2	NP-completeness requires deep analysis to determine problem hardness.
C311.4-PO3	2	Helps in creating efficient algorithms for complex problems.
C311.4-PO4	3	Significant research is needed to classify problems.
C311.4-PO5	2	Uses software tools for analyzing NP-hard problems.
C311.4-PO6	1	Applications exist, but impact varies by field.
C311.4-PO7	3	Efficient algorithms reduce power consumption in computing.
C311.4-PO8	2	Ethical implications in cryptographic and AI-based applications.
C311.4-PO9	1	Primarily an individual research area
C311.4-PO10	1	Requires technical documentation.
C311.4-PO11	2	Complexity impacts cost-effectiveness in projects.
C311.4-PO12	2	Field evolves continuously, requiring ongoing learning.
C311.4-PSO1	3	Fundamental for IT-related optimization and security applications.
C311.4-PSO2	3	Strongly relevant for research, development, and data science roles.

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Subject: Software Engineering Subject Code: CIC309

Course Outcomes

At the end of the course students will be able to:		**Blooms Level**
CIC-309.1	Remember and understand the basic concepts of the software development processes, Software requirements and specifications.	Remember, Understand
CIC-309.2	Apply knowledge of Software Project Planning and various Software design techniques for developing large software systems.	Apply
CIC-309.3	Understand Software Metrics, Software Reliability, and Quality assurance using ISO 9001 and SEI-CMM.	Understand
CIC-309.4	Impart the knowledge and use of software engineering processes and tools to apply, create and evaluate different software systems.	Apply, Create and Evaluate

CO-PO matrices

	PO 1	**PO2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**3**	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**3**	**2**	**2**	**3**	**2**	**2**
CO2	**3**	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**3**	**2**	**2**	**3**	**2**	**2**
CO3	**3**	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**3**	**2**	**2**	**3**	**2**	**2**
CO4	**3**	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**3**	**2**	**2**	**3**	**2**	**2**

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	LOW/MEDIUM/ HIGH	Justification
SE-CIC-309.1 –PO1	3	This CO directly applies mathematical and engineering fundamentals to understand software processes and specifications.
SE-CIC-309.1 –PO2	2	Understanding requirements helps in identifying and formulating complex software problems.
SE-CIC-309.1 –PO3	2	To design and develop solutions effectively, one must grasp the core concepts of software development processes
SE-CIC-309.1 –PO4	2	To conduct investigations of complex software problems, one must leverage knowledge of development processes.
SE-CIC-309.1 –PO5	3	Effective use of modern tools in software development is guided by understanding processes and leveraging requirements.
SE-CIC-309.1 –PO9	3	Understanding software development processes, requirements, and specifications is crucial for effective individual and team work.
SE-CIC-309.1 –PO10	2	Knowledge of software processes provides a common project language and specifications serve as shared reference points.
SE-CIC-309.1 –PO11	2	Understanding software processes guides project, while clear requirements enable accurate resource allocation and cost estimation.
SE-CIC-309.1 –PO12	3	Grasping core software concepts provides a timeless framework for learning, as new methodologies often build on these foundations.
SE-CIC-309.1 –PSO1	2	This comprehensive approach ensures the creation of robust, efficient, and effective solutions in both research and industry contexts.
SE-CIC-309.1 –PSO2	2	By combining logical and analytical thinking, programming expertise, socially responsible software and hardware applications.
SE-CIC-309.2 –PO1	3	Engineering knowledge in software project planning ensures high-quality, scalable, and maintainable large software systems.
SE-CIC-309.2 –PO2	2	Problem analysis in software project planning ensures thorough understanding and decomposition of core issues, feasibility assessment.
SE-CIC-309.2 –PO3	2	This CO directly aligns with designing solutions for complex engineering problems, especially in large software systems.
SE-CIC-309.2 –PO4	2	Ensuring well-informed and effective solutions for developing large software systems.
SE-CIC-309.2 –PO5	3	Applying various design techniques involves using modern engineering tools.
SE-CIC-309.2 –PO9	3	Applying individual and team work resulting successful development of large software systems.
SE-CIC-309.2 –PO10	2	Effective communication in software project planning ensures clear requirements, team coordination, stakeholder engagement, and conflict resolution.
SE-CIC-309.2 –PO11	2	This CO strongly aligns with applying engineering management principles in project planning.

SE-CIC-309.2 –PO12	3	Deliver high-quality solutions for large software systems through evolving project planning and design approaches.
SE-CIC-309.2 –PSO1	2	Address real-time challenges in computer engineering while ensuring efficient project management and high-quality software design.
SE-CIC-309.2 –PSO2	2	developers can create robust, scalable, and efficient software and hardware applications
SE-CIC-309.3 –PO1	3	Applying knowledge of metrics and quality standards.
SE-CIC-309.3 –PO2	2	Establishing quality assurance practices, leading to improved software quality and reliability.
SE-CIC-309.3 –PO3	2	Development of robust, reliable, and high-quality software products.
SE-CIC-309.3 –PO4	2	Applying ISO 9001 and SEI-CMM frameworks aids in conducting thorough investigations of complex problems.
SE-CIC-309.3 –PO5	3	Leveraging modern tools aligned with ISO 9001 and SEI-CMM standards enhances software metric analysis, reliability testing, and quality assurance,
SE-CIC-309.3 –PO9	3	Applying ISO 9001 and SEI-CMM principles fosters individual and team collaboration, enabling systematic analysis of software metrics,
SE-CIC-309.3 –PO10	2	Utilizing ISO 9001 and SEI-CMM fosters effective communication channels, ensuring clear understanding of software metrics
SE-CIC-309.3 –PO11	2	Enhancing software metric analysis, ensuring reliability, and enforcing quality standards, ultimately leading to cost-effective and successful software development projects.
SE-CIC-309.3 –PO12	3	Adopting ISO 9001 and SEI-CMM principles fosters a culture of lifelong learning in software development, encouraging continuous improvement in understanding software metrics
SE-CIC-309.3 –PSO1	2	By integrating computational mathematics, algorithmic formulations, software metrics, quality assurance standards
SE-CIC-309.3 –PSO2	2	By integrating logical and programming skills with a understanding of software metrics, reliability, and quality assurance standards.
SE-CIC-309.4 –PO1	3	Efficiently apply, create, and evaluate diverse software systems, ensuring robust solutions that meet technical requirements.
SE-CIC-309.4 –PO2	2	Gain the capability to conduct thorough problem analysis, effective evaluation methods, ensuring the development of successful and sustainable software systems.
SE-CIC-309.4 –PO3	2	enables the systematic design and development of solutions, efficient implementation ensuring the creation of robust and scalable software systems
SE-CIC-309.4 –PO4	2	Using tools for data analysis and interpretation in software evaluation.
SE-CIC-309.4 –PO5	3	This CO directly aligns with applying modern IT tools in engineering activities.
SE-CIC-309.4 –PO9	3	Software tools often support both individual work and team collaboration.
SE-CIC-309.4 –PO10	2	Tools help in writing reports, documentation, and presentations.

SE-CIC-309.4 –PO11	2	By teaching how to use these tools in team projects, the CO prepares students to manage diverse software projects effectively
SE-CIC-309.4 –PO12	3	Understanding a variety of tools prepares students for ongoing learning as technology changes.
SE-CIC-309.4 –PSO1	2	Understanding and utilizing software metrics, reliability measures, and quality assurance standards
SE-CIC-309.4 –PSO2	2	developers can create robust, efficient, and reliable software and hardware applications.

BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING
Department of Information Technology

Subject: Business Intelligence **Subject Code: DS-431T**

Course Outcomes

At the end of the course students will be able to:		**Bloom Level**
DS-431T.1	Students will be able to describe the Business Intelligence, Data warehouse and Data Mining, explain the structure and different phases of BI, Data warehouse and Data Mining, and discuss the need all these in organization business.	L1 – Remember L2 – Understand
DS-431T.2	Students will be able to apply concepts of OLAP and OLTP and analyze various tools for data warehousing, data mining applications, and techniques for CRM.	L3 – Apply L4 – Analyze
DS-431T.3	Students will be able to evaluate the role of text mining and web mining in business intelligence, and their application in different domains, also will be able to create and implement strategies for enterprise information management, executive information systems, and operational BI while customizing BIsolution.	L5 – Evaluate L6 – Create
DS-431T.4	Students will be able to manage BI projects, differentiate them from traditional IS projects, and identify best practices in BI strategy implementation and apply appropriate KM strategies in different contexts.	L3- Apply L6 – Create

CO-PO matrices

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	1	2	-	-	1	-	1	2	3	-
CO2	3	3	3	3	2	2	-	-	1	-	1	2	3	2
CO3	3	3	3	3	2	2	-	-	1	-	1	2	3	3
CO4	3	3	3	3	1	2	-	-	1	-	1	2	3	3

Levels: 1=Slightly, 2=Moderately, 3=Substantially

JUSTIFICATIONS FOR CO-PO MAPPING

CO No.	PO	Level	Justification
DS-431T.1	PO1	3	Substantially applies engineering knowledge to fundamentalconcepts.
	PO2	3	Substantially recognizes the need for life-long learning.
	PO3	3	Substantially applies problem-solving techniques.
	PO4	3	Uses research methods in Business Intelligence.
	PO5	1	Slightly applies modern tool usage for all
	PO6	2	Moderately considers societal and cultural aspects.
	PO9	1	Slightly involves teamwork.
	PO11	1	Slightly applies project management principles.
	PO12	2	Moderately emphasizes lifelong learning.
	PSO1	3	Substantially provides IT-based solutions through BI knowledge.
DS-431T.2	PO1	3	Substantially involves problem analysis in OLAP & OLTP concepts.
	PO2	3	Substantially utilizes modern tools for data warehousing and analytics.
	PO3	3	Substantially involves communication in documenting implementations.
	PO4	3	Substantially applies research-based methods for analyzing data warehousing techniques.
	PO5	2	Moderately applies modern tool usage for data analysis and management.
	PO6	2	Moderately considers legal, social, and ethical aspects in data analytics.
	PO9	1	Slightly applies teamwork and collaboration in data-driven projects.
	PO11	1	Slightly involves project management principles in business intelligence.
	PO12	2	Moderately emphasizes lifelong learning in emerging BI technologies.
	PS01	3	Substantially applies IT solutions in data warehousing and customer relationship management.
	PSO2	2	Moderately prepares for developer/tester roles in BI and data analytics.
DS-431T.3	PO1	3	Substantially applies knowledge of text mining and web mining techniques.
	PO2	3	Substantially investigates business intelligence problems through research.
	PO3	3	Substantially applies modern tools for text and web mining analysis.

	PO4	3	Substantially uses research-based approaches for enterprise information management.
	PO5	2	Moderately applies modern tools for information extraction and decision-making.
	PO6	2	Moderately assesses societal and ethical implications of mining techniques.
	PO9	1	Slightly involves teamwork and collaboration in business intelligence projects.
	PO11	1	Slightly applies project management skills in mining-related tasks.
	PO12	2	Moderately emphasizes lifelong learning for adapting to new data mining technologies.
	PSO1	3	Substantially applies advanced analytics for enterprise decision-making.
	PSO2	3	Substantially prepares for analyst and developer roles in BI and data mining.

DS-431T.4	PO1	3	Substantially analyzes Business Intelligence (BI) project management methodologies.
	PO2	3	Substantially designs and develops BI strategies for decision-making.
	PO3	3	Substantially implements modern optimization techniques in BI.
	PO4	3	Substantially involves research-based analysis in BI project development.
	PO5	1	Slightly applies modern tool usage for managing BI implementations.
	PO6	2	Moderately considers legal, ethical, and social aspects in BI project execution.
	PO9	1	Slightly integrates teamwork and collaboration in BI strategy development.
	PO11	1	Slightly applies financial and managerial aspects in BI project handling.
	P012	2	Moderately emphasizes continuous learning and adapting BI technologies.
	PSO1	3	Substantially applies BI methodologies for providing IT-based solutions.
	PSO2	3	Substantially prepares for managerial roles in BI project execution.

BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING
Department of Information Technology

Course: Social Network Analysis and Sentiment Analysis Paper Code: CIE-409T

Course Outcomes

At the end of the course students will be able to:		Bloom Level
CIE-409T.0031	To describe the various types of graphs explain the structure and different working of graph, and discuss the need of graphs and in cooperating with programming.	L1 – Remember L2 – Understand
CIE-409T.2	To analyze the social networks and analysis, design and implement sentiment analysis, and expressions the network centrality.	L3 – Apply L4 – Analyze
CIE-409T.3	To develop and evaluate sentimental opinions and develop the techniques for Sentiment Classification.	L5 – Evaluate L6 – Create
CIE-409T.4	To apply sentence subjectivity, sentiment classification techniques and methods of features extraction, exploring syntactic relations, implement to optimize strategies.	L3 – Apply L6 – Create

CO-PO matrices

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	-	-	2	2	2	2	2	2	2	3	-
CO2	2	2	1	-	3	-	-	-	-	-	-	2	3	2
CO3	2	3	1	-	2	3	2	2	-	2	2	2	3	3
CO4	2	2	1	-	2	-	2	2	-	2	-	3	3	3

Levels: 1=Slightly, 2=Moderately, 3=Substantially

JUSTIFICATIONS FOR CO-PO MAPPING

CO No.	PO	Level	Justification
CIE-409.1	PO1	3	Substantially applies engineering knowledge to fundamental concepts of the graphs.
	PO2	3	Substantially involves problem analysis in social networks. learning.
	PO3	2	Moderately provides designs and evaluates techniques to provide solution.
	PO6	2	Moderately apply the engineering knowledge for society.
	PO7	2	Moderately understand the impact of social networking and need of it for development.
	PO8	2	Moderately apply the ethics of opinion and develop the responsibility, roles of the same.
	PO9	2	Moderately understand and collaborates in teams.
	PO10	2	Moderately involves in sentiment classification communication, design documenting, presentation and in implementations.
	PO11	2	Moderately understand the supervised learning and work in teams to development solution.
	PO12	2	Moderately understand the impact of social networking and need of it for development.
	PSO1	3	Substantially applies trends social networks.
CE3-409.2	PO1	2	Moderately involves in problem analysis in social society networks.
	PO2	2	Moderately utilizes modern tools for understand and analyzing the problem and provide solutions.
	PO3	1	Involve in design and implement the techniques in opinion and its enhancement.
	PO5	3	Substantially use modern tools for graphs and networks .
	PO12	2	Moderately prepares for developer/tester roles.
	PSO1	3	Substantially applies, develop the networks centrality.
	PSO2	2	Provide IT based solutions in user friendly environment.
CIE-409.3	PO1	2	Moderately designs and evaluates centrality measure strong and weak ties.
	PO2	3	Substantially Identify, formulate, and analyze complex engineering problems to reaching conclusions.
	PO3	1	develop the solutions as per the need of the society.
	PO5	2	Moderately create, select IT tools for cluster networks.

	PO6	3	Substantially uses advanced techniques for the analysis of centrality measures..
	PO7	2	Moderately understand the impact of the professional engineering solutions in societal network environmental.
	PO8	2	Moderately apply ethical principles and norms of the engineering practice.
	PO10	2	Moderately one can work in team, individual also.
	PO11	2	Moderately communicate effectively on complex activities with community and with society.
	PO12	2	Moderately demonstrate knowledge and understanding of the engineering and management principles in multidisciplinary environments.
	PSO1	3	Substantially prepares for analyst/developer roles.
	PSO2	3	Substantially developer implement sentiments networks.
CIE-409.4	PO1	2	Analyzes syntax-directed translation and optimization.
	PO2	2	Substantially designs optimized code generation.
	PO3	1	Substantially implements modern optimization techniques.
	PO5	2	Moderately involves project management.
	PO7	2	Substantially applies code optimization techniques.
	PO8	2	Substantially prepares for developer/tester roles in optimization and code generation.
	PO10	2	Moderately one can work develop applications in team, individual also.
	PO12	3	Moderately demonstrate, apply knowledge and understanding of the engineering and management in multidisciplinary environments.
	PSO1	3	Apply the IT tools in analyst/developer roles.
	PSO2	3	Substantially researchers/developers will optimized the sentiments.

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Course Name: PATTERN RECO& COMPUTER VISION Course Code: ML-411T

Course Outcomes:

At the end of the course, students will be able to		Bloom Level(s)
ML-411T.1	Discuss various concepts of pattern recognition	Understand Remember
ML-411T.2	Understanding various algorithms	Understand Create
ML-411T.3	Explain and apply various computer vision techniques	Apply Evaluate
ML-411T.4	Describe the concept of shape analysis and filtering	Analyse Evaluate

CO-PO matrices

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
ML-411T.1	3	2	2	3	3	-	2	-	-	1	3	2	-	-
ML-411T.2	3	3	1	1	1	-	1	1	-	2	2	1	-	-
ML-411T.3	3	2	3	3	2	-	2	-	-	2	3	1	-	-
ML-411T.4	1	2	3	2	2	-	1	-	-	1	2	2	1	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

JUSTIFICATIONS FOR CO-PO-PSO MAPPING

ML-411T.1 PO1	HIGH	Basis concepts of pattern recognition help to enhance the engineering knowledge
ML-411T.1 PO2	MEDIUM	The concepts of pattern recognition help in solving real-world problems and analyze complex engineering problems
ML-411T.1 PO3	MEDIUM	Design solutions for complex engineering problem's solutions that Can be solved.
ML-411T.1 PO4	HIGH	Students get Research-based knowledge and can be acquired.
ML-411T.1 PO5	HIGH	Students get the knowledge of basic concepts of pattern recognition to analyze complex engineering activities.
ML-411T.1 PO7	MEDIUM	Students can apply the knowledge of basic pattern recognition to assess societal issues relevant to professional engineering practice.
ML-411T.1 PO10	LOW	Students will be able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
ML-411T.1 PO11	HIGH	Students can demonstrate their knowledge and understanding of engineering and management principles while preparing for their projects on pattern recognition.
ML-411T.1 PO12	MEDIUM	Real systems has to deal with pattern data and its analysis, so this is a lifelong learning.
ML-411T.2 PO1	HIGH	Students can create a prototype using various algorithms applying their engineering knowledge.
ML-411T.2 PO2	HIGH	Students will be able to understand various algorithms to enhance the engineering knowledge
ML-411T.2 PO3	LOW	Students will be able to solve problems in the study and development of various algorithms
ML-411T.2 PO4	LOW	Students get Research-based knowledge on the study of algorithms
ML-411T.2 PO5	LOW	Students use software tools to perform searching and sorting algorithms.
ML-411T.2 PO7	LOW	The study of various algorithms helps in understanding the impact of professional engineering solutions in societal and environmental contexts.
ML-411T.2 PO8	LOW	The study and development of various algorithms deals with professional ethical principles
ML-411T.2 PO10	MEDIUM	Students will be able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions while designing algorithms.
ML-411T.2 PO11	MEDIUM	Design of various algorithms help students to manage projects in multidisciplinary environments.
ML-411T.2 PO12	LOW	Study of various algorithms deals with data analysis, so this can be used lifelong learning.
ML-411T.3 PO1	HIGH	Students can Identify the role of computer vision techniques and create a prototype, applying engineering knowledge.

ML-411T.3 PO2	MEDIUM	The study of computer vision techniques helps in solving complex engineering problems.
ML-411T.3 PO3	HIGH	Students will be able to use computer vision techniques to develop engineering solutions.
ML-411T.3 PO4	HIGH	Students get Research-based knowledge while studying the concepts of computer vision and can be highly acquired.
ML-411T.3 PO5	MEDIUM	Using simulation tools, design solutions for complex engineering problem's solutions.
ML-411T.3 PO7	MEDIUM	The study of computer vision techniques helps in understanding the impact of professional engineering solutions in societal and environmental contexts.
ML-411T.3 PO10	MEDIUM	Students will be able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
ML-411T.3 PO11	HIGH	Students can work as team leaders, managing their project finances and have a quality to lead the team in professional activities.
ML-411T.3 PO12	LOW	The study of computer vision techniques has to deal with Data processing and analysis, so this is a lifelong learning.
ML-411T.4 PO1	LOW	Students can Identify the role of image analysis and filtering techniques using MATLAB or python and create a prototype.
ML-411T.4 PO2	MEDIUM	Students will have foundation of the image processing to enhance the engineering knowledge
ML-411T.4 PO3	HIGH	It helps in analyzing and solving the complex engineering problems
ML-411T.4 PO4	MEDIUM	Students can get research-based knowledge with the deep study on image processing
ML-411T.4 PO5	MEDIUM	Students get good knowledge of software tools to complex engineering activities.
ML-411T.4 PO7	LOW	The study of image processing helps in understanding the impact of professional engineering solutions in societal and environmental contexts.
ML-411T.4 PO10	LOW	Students will be able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
ML-411T.4 PO11	MEDIUM	Students can work as team leaders, managing their project finances and have a quality to lead the team in professional activities.
ML-411T.4 PO12	MEDIUM	The study of image processing has to deal with Data processing and analysis, so this is a lifelong learning.
ML-411T.4 POS1	LOW	The image processing and filtering deals with a indirect but thorough understanding of electronics circuits for analog and digital systems and is thus, mapped at a low scale.

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Subject Name: Reinforcement Learning and Deep Learning Subject Code: ML-409T

Course Outcome

At the end of the course, student will be able to		**Bloom's Level**
ML-409P.1	Learn how to define RL tasks and the core principals behind the RL, including policies, value functions, deriving Bellman equations and understand and work with approximate solution (deep Q Network based algorithms)	Remember Understand
ML-409P.2	Learn the policy gradient methods from vanilla to more complex cases and learn application and advanced techniques in Reinforcement Learning .	Understand Analyze
ML-409P.3	Apply neural networks and create different models for problem solving .	Apply Create
ML-409P.4	Able to Analyze images and evaluate the applications of NLP in deep learning .	Analyze Evaluate

CO-PO Matrices

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
ML-409T.1	3	2	3	3	3	2	2	-	-	-	-	2		
ML-409T.2	3	2	3	3	3	2	2	-	-	-	-	2		
ML-409T.3	3	2	3	3	3	2	2	-	-	-	-	2		
ML-409T.4	3	3	3	3	3	2	2	-	-	-	-	2		

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Justification for CO-PO Mapping

Mapping	LOW/MEDIUM/ HIGH	Justification
ML-409T.1-PO1	HIGH	CO1 strongly aligns with PO1 by demonstrating the application of engineering knowledge in understanding deep learning and problem-solving strategies.
ML-409T.1-PO2	MEDIUM	For engineers to methodically approach ML challenges and ensure comprehensive and successful solutions based on strong analytical principles, it is imperative that they have a good understanding of both reinforcement learning and deep learning problems.
ML-409T.1-PO3	HIGH	CO1 strongly aligns with PO3 as understanding deep learning problems helps in analyzing the complex engineering problems and apply models to design solutions to these problems.
ML-409T.1-PO4	HIGH	CO1 is in strong agreement with PO4 because it guarantees thorough research that results in strong and creative deep learning applications.
ML-409T.1-PO5	HIGH	CO1 strongly aligns with PO5 by emphasizing the use of modern engineering tools.
ML-409T.1-PO6	MEDIUM	Comprehending machine learning and problem-solving techniques guarantees that machine learning solutions are morally and socially responsible, improving community well-being.
ML-409T.1-PO7	MEDIUM	CO1 moderately aligns with PO10 as creating machine learning models enhance effective communication.
ML-409T.1-PO12	MEDIUM	CO1 strongly aligns with PO12 as creating deep learning models contributes to effective project management in software development projects.
ML-409T.1-PSO1	MEDIUM	CO1 strongly aligns with PSO 1 as comprehending deep learning enables to effectively address intricate deep learning issues. Using the newest technologies and learning the principles of computer science and engineering guarantees efficient real-time solutions to a variety of engineering problems.
ML-409T.1-PSO2	MEDIUM	Understanding reinforcement and deep learning and problem-solving strategies is crucial for addressing complex engineering problems across diverse industries, supporting your capability to find effective solutions using advanced tools.
ML-409T.2-PO1	HIGH	CO2 strongly aligns with PO1 as understanding policy gradient methods and analyzing reinforcement learning applications ensures building complex projects.
ML-409T.2-PO2	MEDIUM	CO2 moderately aligns with PO2 as Applying reinforcement learning technique enable engineers to systematically decompose complex problems, identify dependencies, and derive conclusions.
ML-409T.2-PO3	HIGH	CO2 strongly aligns with PO3 as it involves research-based investigation.
ML-409T.2-PO4	HIGH	CO2 strongly aligns with PO4 as applying reinforcement techniques enable engineers to analyze data, formulate hypotheses, and draw conclusions systematically.
ML-409T.2-PO5	HIGH	CO2 strongly aligns with PO5 as application of advance reinforcement techniques enable engineers to effectively demonstrate the use of modern engineering tools, including applying computational problem to implement various problems.
ML-409T.2-PO6	MEDIUM	CO2 moderately aligns with PO6 as applying advance reinforcement learning technique ensures that engineering solutions are socially responsible, ethical, and contribute positively to society's well-being.
ML-409T.2-PO7	MEDIUM	CO2 strongly aligns with PO7 as proficiency in efficiency of computation leads effective project management in software development projects.
ML-409T.2-PO12	MEDIUM	CO2 contributes PO12 as continuous` learning to design applications by using reinforcement learning techniques.
ML-409T.2-PSO1	MEDIUM	CO3 moderately aligns with PO1 by demonstrating the application of engineering knowledge in creating deep learning applications through

		understanding of policy gradient methods
ML-409T.2-PSO2	MEDIUM	CO3 moderately aligns with PO2 by applying advance techniques of reinforcement learning to derive to the conclusions.
ML-409T.3-PO1	HIGH	CO3 strongly aligns with PO1 applying neural networks, is crucial for engineers to design and optimize models ensures effective application in diverse engineering contexts.
ML-409T.3-PO2	MEDIUM	CO3 moderately aligns with PO2 evaluate neural networks may lead to research-based investigation.
ML-409T.3-PO3	HIGH	CO3 strongly aligns with PO3 by demonstrating the use of modern engineering tools by applying neural networks to build robust model.
ML-409T.3-PO4	HIGH	Application of neural networks ensures comprehensive investigation and facilitates the development of informed solutions to complex engineering challenges.
ML-409T.3-PO5	HIGH	CO3 strongly aligns with PO5 as applying neural network ensures proficiency in tool usage, facilitating the implementation of efficient deep learning solutions in engineering applications.
ML-409T.3-PO6	MEDIUM	CO3 moderately aligns with PO6 as applying neural network and analyzing various deep learning techniques ensures that engineering solutions using deep learning contribute positively to society's well-being and adhere to ethical standards.
ML-409T.3-PO7	MEDIUM	Understanding the basic concepts of neural networks and analyzing various reinforcement learning techniques ensures that RL-based solutions contribute to environmental sustainability by improving efficiency, reducing waste, and promoting eco-friendly practices in engineering applications.
ML-409T.3-PO12	MEDIUM	CO3 moderately aligns with PO12 as application of neural networks prepare students for continuous learning in the evolving field of software engineering and technology.
ML-409T.3-PSO1	MEDIUM	Understanding and analyzing various neural network models enhances the ability to learn basic concepts of Computer Science and Engineering and apply effective real-time solutions to complex engineering problems using the latest tools. This approach supports skill development and practical application in addressing Computer Science and Engineering related challenges, fostering proficiency in engineering applications.
ML-409T.3-PSO2	MEDIUM	Understanding and analyzing various machine learning techniques prepares you to develop applications that evaluate supervised learning models, essential for pursuing higher education and professional careers in cutting-edge industries.
ML-409T.4-PO1	HIGH	CO4 strongly aligns with PO1 Developing an application in deep learning ensures effective model selection and performance optimization in engineering applications.
ML-409T.4-PO2	MEDIUM	CO4 moderately aligns with PO2 as Developing a deep learning application ensure robust performance and effective problem analysis in engineering applications.
ML-409T.4-PO3	HIGH	CO4 strongly aligns with PO3 as creating and designing deep learning applications ensures effective performance evaluation in engineering.
ML-409T.4-PO4	HIGH	CO4 moderately aligns with PO4 as developing a neural network ensures effective problem analysis and solution development in engineering applications.
ML-409T.4-PO5	HIGH	CO4 strongly aligns with PO5 as developing a neural network based application ensure robust evaluation, supporting comprehensive problem analysis and solution development in engineering applications.
ML-409T.4-PO6	MEDIUM	Developing a NLP based application includes data preprocessing, feature engineering, and using cross-validation and metrics for thorough evaluation, ensuring effective use of advanced tools in engineering applications.
ML-409T.4-PO7	MEDIUM	Developing a deep learning based evaluation application assess model performance using metrics to ensure responsible deployment and positive impact on society, integrating feedback for continuous improvement in engineering applications.
ML-409T.4-PO12	MEDIUM	CO2 moderately aligns with PO12 as developing a deep learning model

		supports lifelong learning by integrating the latest techniques, ensuring ongoing skill development and adaptability in engineering applications
ML-409T.4-PSO1	MEDIUM	Developing an application to evaluate different types of deep learning techniques enables learning basic concepts of Computer Science and Engineering and the ability to apply effective real-time solutions to complex engineering problems using the latest tools.
ML-409T.4-PSO2	MEDIUM	Developing an application to evaluate NLP applications of deep learning techniques supports acquiring advanced knowledge for pursuing higher education or a professional career in the field of computer science.

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Course Name: Data Science using R **Course Code: DS-427 T**

Course Outcome:

At the end of the course, students will be able to		**Bloom Level(s)**
DS-427T.1	Understand basics of data science and R programming.	Understand
DS-427T.2	Understand and visualize data using statistical functions and plots.	Remember
DS-427T.3	Explain how to obtain, store, explore, and model data efficiently.	Understand
DS-427T.4	Apply probability and statistics for data science	Apply

CO-PO matrices

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO 11	PO 12	PSO 1	PSO 2
DS-427T.1	1	2	-	3	2	-	1	-	-	-	-	-	2	-
DS-427T.2	-	-	-	3	2	-	2	-	-	-	-	-	-	3
DS-427T.3	-	-	-	2	2	-	2	-	-	-	-	-	2	-
DS-427T.4	-	1	-	3	2	-	3	2	2	-	-	-	1	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) If there is no correlation, put "-"

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	LOW/MEDIUM/ HIGH	Justification
DS-427T.1-PO1	LOW	Students must have the knowledge of Principles of mathematics and engineering Sciences to apply control structures.
DS-427T.1-PO2	MEDIUM	Knowledge of control structures: if else, loops etc. in data science can help students to analyse the problem and data thus enabling them in identifying a suitable solution for the complex engineering problems.
DS-427T.1-PO4	HIGH	Control structure concepts can be used to design and conduct experiment to provide valid conclusions.
DS-427T.1-PO5	MEDIUM	Expertise knowledge of control structures will enable the students to use modern tools for various purposes.
DS-427T.1-PO7	LOW	Students will able to work effectively as an individual, and as a member or leader in diverse teams by applying control structures.
DS-427T.1-PSO1	MEDIUM	Knowledge of control structures helps students in communicating effectively on complex engineering activities.
DS-427T.2-PO4	HIGH	Students will become aware of the need for lifelong learning and continued upgrading of technical knowledge.
DS-427T.2-PO5	HIGH	The concept of control structures help students to apply fundamentals of computational mathematics and algorithmic formulations to solve the real-time problems in research and industry.
DS-427T.2-PO7	MEDIUM	Students will be capable to design and develop applications using logical, analytical, and programming skills based on the control structures of data science.
DS-427T.2-PSO2	HIGH	Students must have the knowledge of Principles of mathematics and engineering Sciences to apply functions and strings.
DS-427T.3-PO4	MEDIUM	Knowledge of functions and strings in can help students to analyse the problem and data thus enabling them in identifying a suitable solution for the complex engineering problems.
DS-427T.3-PO5	MEDIUM	Using the knowledge of functions and strings, students can design and develop solutions for Complex engineering problems.
DS-427T.3-PO7	MEDIUM	Concepts of functions and strings can be used to design and conduct experiment to provide valid conclusions.
DS-427T.3-PSO1	MEDIUM	Expertise knowledge of functions and strings will enable the students to use modern tools for various purposes.
DS-427T.4-PO2	LOW	Students will able to work effectively as an individual, and as a member or leader in diverse teams by applying functions and strings.
DS-427T.4-PO4	HIGH	Knowledge of functions and strings helps students in communicating effectively on complex engineering activities.
DS-427T.4-PO7	HIGH	Students will be able to demonstrate knowledge in managing different projects based on python language.
DS-427T.4-PO8	MEDIUM	Knowledge of functions and strings helps students prepare and engage them in lifelong learning.
DS-427T.4-PO9	MEDIUM	The concept of functions and strings will help students to apply fundamentals of computational mathematics and algorithmic formulations to solve the real- time problems in research and industry.
DS-427T.4-PSO1	LOW	Students will be capable to design and develop applications using logical, analytical, and programming skills based on functions and strings in R programming.

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Department of Information Technology

Course Name: Machine Learning **Course Code:** CIE-421T

Course Outcomes:

At the end of the course, student will be able to:-		**Blooms Level**
CIE-421T.1	To formulate machine learning problems	Understand, Apply
CIE-421T.2	Learn about regression and feature selection techniques	Remember, Understand, Apply
CIE-421T.3	Apply machine learning techniques such as classification to practical applications	Understand, Remember, Apply, Analyze
CIE-421T.4	Develop an application that evaluate different types of supervised learning techniques.	Apply, evaluate, create

CO-PO matrices

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
CO2	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**2**	**2**
CO4	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**2**	**2**

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	LOW/MEDIUM/ HIGH	Justification
CIE-421T.1 -PO1	3	Understanding machine learning and problem-solving strategies is crucial for developing ML applications, which rely on engineering principles like mathematics, programming, and systems thinking.
CIE-421T.1 -PO2	3	Understanding machine learning problems is essential for analyzing and addressing complex problems in ML applications. These concepts enable engineers to break down and systematically approach ML challenges, ensuring thorough and effective solutions based on solid analytical principles.
CIE-421T.1 -PO3	3	Understanding machine learning ensures the development of robust, innovative ML applications that meet specific requirements and perform optimally.
CIE-421T.1 –PO4	3	Understanding machine learning problems ensures comprehensive investigations that lead to robust and innovative ML applications.
CIE-421T.1-PO5	3	Understanding machine learning and problem-solving strategies ensures the proficient use of modern ML tools, leading to innovative and efficient solutions.
CIE-421T.1-PO6	2	Understanding machine learning and problem-solving strategies ensures that ML solutions are socially responsible, ethical, and enhance the well-being of communities.
CIE-421T.1-PO7	2	Understanding machine learning and problem-solving strategies enable engineers to create intelligent systems that optimize resource use, reduce waste, and address ecological challenges.
CIE-421T.1-PO12	2	Understanding machine learning and problem-solving strategies equip engineers with the skills to continually adapt to new technologies, methodologies, and advancements in ML.
CIE-421T.2 -PO1	3	Understanding regression and feature selection technique enable engineers to formally represent and analyse complex systems, ensuring precise and accurate problem-solving.
CIE-421T.2-PO2	3	Applying regression and feature selection technique enable engineers to systematically decompose complex problems, identify dependencies, and derive conclusions.
CIE-421T.2 -PO3	3	Applying regression and feature selection technique enable engineers to formalize requirements, specify system behavior, and verify the correctness of designs.
CIE-421T.2 –PO4	3	Applying regression and feature selection technique enable engineers to analyse data, formulate hypotheses, and draw conclusions systematically. Utilizing this knowledge ensures thorough investigation and enables the development of informed solutions to complex engineering challenges.
CIE-421T.2-PO5	3	Applying regression and feature selection technique enable engineers to effectively use advanced software and technologies for modeling, simulation, and analysis. Utilizing this knowledge ensures proficiency in modern tool usage, leading to innovative and efficient solutions in engineering applications
CIE-421T.2-PO6	2	Applying regression and feature selection technique ensures that engineering solutions are socially responsible, ethical, and contribute positively to society's well-being.
CIE-421T.2-PO7	2	Applying regression and feature selection technique enable engineers to model and analyse environmental impacts, optimize resource use, and design systems that minimize ecological footprint.

CIE-421T.2-PO12	2	Applying regression and feature selection technique supports ongoing professional growth, ensuring engineers can innovate and solve new challenges throughout their careers.
CIE-421T.3 -PO1	3	Understanding machine learning techniques such as classification basics along with regression, clustering, and neural networks, is crucial for engineers to design and optimize models. Applying engineering knowledge ensures effective application in diverse engineering contexts, supporting innovation and problem-solving.
CIE-421T.3-PO2	3	Understanding the basic concepts of machine learning and classification learning, enable engineers to systematically decompose problems, select appropriate ML algorithms, and evaluate model performance to derive effective solutions.
CIE-421T.3 -PO3	3	Understanding the basic concepts of machine learning and classification enable engineers to select and apply appropriate ML algorithms, optimize model parameters, and integrate ML solutions into robust engineering systems.
CIE-421T.3 –PO4	3	Understanding the basic concepts of machine learning (ML) and analyzing various ML techniques ensures comprehensive investigation and facilitates the development of informed solutions to complex engineering challenges.
CIE-421T.3-PO5	3	Understanding the basic concepts of machine learning and analyzing various ML techniques ensures proficiency in modern tool usage, facilitating the implementation of innovative and efficient ML solutions in engineering applications.
CIE-421T.3-PO6	2	Understanding the basic concepts of machine learning and analyzing various ML techniques ensures that engineering solutions using ML contribute positively to society's well-being and adhere to ethical standards.
CIE-421T.3-PO7	2	Understanding the basic concepts of machine learning and analyzing various ML techniques ensures that ML-based solutions contribute to environmental sustainability by improving efficiency, reducing waste, and promoting eco-friendly practices in engineering applications.
CIE-421T.3-PO12	2	Understanding the basic concepts of machine learning and analyzing various ML techniques ensures engineers can innovate and solve new challenges throughout their careers, staying current with the evolving field of ML.
CIE-421T.4 -PO1	3	Developing an application to evaluate supervised learning techniques ensures effective model selection and performance optimization in engineering applications.
CIE-421T.4-PO2	3	Developing a supervised learning evaluation application ensure robust performance and effective problem analysis in engineering applications.
CIE-421T.4 -PO3	3	Developing a supervised learning evaluation application ensures robust solution development, optimization of model parameters, and effective performance evaluation in engineering applications.
CIE-421T.4 –PO4	3	Developing a supervised learning evaluation application ensures effective problem analysis and solution development in engineering applications.
CIE-421T.4-PO5	3	Developing a supervised learning evaluation application ensure robust evaluation, supporting comprehensive problem analysis and solution development in engineering applications.
CIE-421T.4-PO6	2	Developing a supervised learning evaluation application includes data preprocessing, feature engineering, and using cross-validation and metrics for thorough evaluation, ensuring effective use of advanced tools in engineering applications.
CIE-421T.4-PO7	2	Developing a supervised learning evaluation application assess model performance using metrics to ensure responsible deployment and positive impact on society, integrating feedback for continuous improvement in engineering applications.

CIE-421T.4-PO12	2	Developing a supervised learning evaluation application supports lifelong learning by integrating the latest techniques, ensuring ongoing skill development and adaptability in engineering applications.
CIE-421T.1-PSO1	2	Understanding machine learning equips you to solve complex ML problems efficiently. Learning IT Engineering fundamentals and using the latest tools ensures effective real-time solutions to diverse engineering challenges.
CIE-421T.1-PSO2	2	Understanding machine learning and problem-solving strategies is crucial for addressing complex engineering problems across diverse industries, supporting your capability to find effective solutions using advanced tools.
CIE-421T.2-PSO1	2	Understanding and applying regression techniques enhances problem-solving capabilities and supports the acquisition of advanced knowledge for pursuing higher education or a professional career in sectors such as Healthcare, Process Industry, Power Sector, IT, and Management.
CIE-421T.2-PSO2	2	Understanding and applying regression technique enhances your ability to analyze and develop efficient solutions, contributing to innovative practices in Healthcare, Process Industry, Power Sector, IT, and Management.
CIE-421T.3-PSO1	2	Understanding and analyzing various machine learning techniques enhances the ability to learn basic concepts of IT Engineering and apply effective real-time solutions to complex engineering problems using the latest tools. This approach supports skill development and practical application in addressing IT-related challenges, fostering proficiency in engineering applications.
CIE-421T.3-PSO2	2	Understanding and analyzing various machine learning techniques prepares you to develop applications that evaluate supervised learning models, essential for pursuing higher education and professional careers in cutting-edge industries.
CIE-421T.4-PSO1	2	Developing an application to evaluate different types of supervised learning techniques enables learning basic concepts of IT Engineering and the ability to apply effective real-time solutions to complex engineering problems using the latest tools.
CIE-421T.4-PSO2	2	Developing an application to evaluate different types of supervised learning techniques supports acquiring advanced knowledge for pursuing higher education or a professional career in Healthcare, Process Industry, Power Sector, IT, and Management.

BHARATI VIDYAPEETH'S COLLEGE OF ENGINEERING
Department of Information Technology

Subject: Big Data Analytics **Subject Code: DS- 429 T**

Course Outcomes:

At the end of the course student will be able to:		PO/ PSO	Bloom Level
DS429T.1	Understand the core concepts of Big Data, including its characteristics, sources, and importance in the modern data-driven world.	PO1-PO3, PSO1, PSO2	**L1- Remember** **L2-Understand**
DS429T.2	Apply distributed computing frameworks such as Hadoop for processing large datasets.	PO1-PO5, PSO1,PSO2	**L1- Remember** **L2-Understand** **L3- Apply**
DS429T.3	Design and implement data models using NoSQL databases like MongoDB for handling unstructured data.	PO1-PO5, PSO1, PSO2	**L3- Apply** **L4- Analyze** **L5- Evaluate** **L6 - Create**
DS429T.4	Evaluate and implement advanced Big Data analytics techniques like machine learning and predictive analytics using frameworks such as Pig, Hive, HiveQL, Zookeeper, and IBM Infosphere to solve real-world problems.	PO1-PO7, PSO1, PSO2	**L2-Understand** **L3-Apply** **L4 – Analyze** **L5- Evaluate**

CO-PO matrices

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
DS429T.1	3	2	1	-	-	-	-	-	-	-	-	-	2	2
DS429T.2	3	3	3	2	3	-	-	-	-	-	-	2	2	2
DS429T.3	3	3	2	2	3	-	-	-	-	-	-	-	2	2
DS429T.4	3	3	3	3	3	2	2	-	-	-	-	2	2	2

1=Slightly, 2=moderately, 3=substantially

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	LOW/ MEDIUM/ HIGH	Justification
DS429T.1-PO1	3	Understanding the core concepts of Big Data, including its characteristics, sources, and importance in the modern data-driven world can be used to apply the knowledge of engineering fundamentals to the solution of engineering problems.
DS429T.1-PO2	2	Understand the core concepts of Big Data, including its characteristics, sources, and importance is used for Designing solutions for complex engineering problems.
DS429T.1-PO3	1	Understand the core concepts of Big Data, including its characteristics, sources, and importance in the modern data-driven world.to design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
DS429T.1-PSO1	2	Understand the core concepts of Big Data, including its characteristics, sources, and importance in the modern data-driven world to provide Information Technology based Solutions into user environment through currents trends, technologies and practices.
DS429T.1-PSO2	2	Understand the core concepts of Big Data, including its characteristics, sources, and importance in the modern data-driven world.to provide platform to obtain position in Information Technology such as researcher, developer, analyst, tester and administrator in both government and private sector.
DS429T.2-PO1	3	Apply distributed computing frameworks such as Hadoop for processing large datasets to the solution of complex engineering problems.
DS429T.2-PO2	3	Apply distributed computing frameworks such as Hadoop for processing large datasets to the solution of engineering problems to analyze engineering problems to arrive at substantiated conclusions.
DS429T.2-PO3	3	Apply distributed computing frameworks such as Hadoop for processing large datasets to design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
DS429T.2-PO4	2	Apply distributed computing frameworks such as Hadoop for experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
DS429T.2-PO5	3	Apply distributed computing frameworks such as Hadoop for processing large datasets to create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities.
DS429T.2-PO12	2	Apply distributed computing frameworks such as Hadoop as it has ability to engage in independent and life-long learning in the broadest context of technological change.
DS429T.2-PSO1	2	Apply distributed computing frameworks such as Hadoop to provide Information Technology based Solutions into the user environment through currents trends, technologies and practices.
DS429T.2-PSO2	2	Apply distributed computing frameworks such as Hadoop for provide platform to obtain position in Information Technology such as researcher, developer, analyst, tester and administrator in both Government and Private sector.

DS429T.3-PO1	3	Design and implement data models using NoSQL databases like MongoDB for handling unstructured data to apply the knowledge of engineering fundamentals, and an engineering specialization to the solution of engineering problems.
DS429T.3-PO2	3	Design and implement data models using NoSQL databases like MongoDB for handling unstructured data to analyze complex engineering problems reaching substantiated conclusions.
DS429T.3-PO3	2	Design and implement data models using NoSQL databases like MongoDB for handling unstructured data to Design solutions for complex engineering problems and design system components.
DS429T.3-PO4	2	Design and implement data models using NoSQL databases like MongoDB for handling unstructured data to interpret data, and synthesis of the information to provide valid conclusions.
DS429T.3-PO5	3	Design and implement data models using NoSQL databases like MongoDB for handling unstructured data to complex engineering activities with an understanding of the limitations.
DS429T.3-PSO1	2	Design and implement data models using NoSQL databases like MongoDB for handling unstructured data to provide Information Technology based Solutions into the user environment through currents trends, technologies and practices.
DS429T.3-PSO2	2	Design and implement data models using NoSQL databases like MongoDB for handling unstructured data to provide platforms to obtain position in Information Technology such as researcher, developer, analyst, tester and administrator in both Government and Private sector.
DS429T.4-PO1	3	Evaluate and implement advanced Big Data analytics techniques like machine learning and predictive analytics using frameworks such as Pig, HiveQL, Zookeeper, and IBM Infosphere to solve real-world problems for the solution of complex engineering problems.
DS429T.4-PO2	3	Evaluate and implement advanced Big Data analytics techniques like machine learning and predictive analytics using frameworks such as Pig, HiveQL, Zookeeper, and IBM Infosphere to Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions.
DS429T.4-PO3	3	Evaluate and implement advanced Big Data analytics techniques like machine learning and predictive analytics using frameworks such as Pig, HiveQL, Zookeeper, and IBM Infosphere to Design solutions for complex engineering problems and design system components
DS429T.4-PO4	3	Evaluate and implement advanced Big Data analytics techniques like machine learning and predictive analytics using frameworks such as Pig, HiveQL, Zookeeper, and IBM Infosphere to analysis and interpret data, and synthesis of the information to provide valid conclusions.
DS429T.4-PO5	3	Evaluate and implement advanced Big Data analytics techniques like machine learning and predictive analytics using frameworks such as Pig, HiveQL, Zookeeper, and IBM Infosphere to create, select, and apply appropriate techniques, resources, and modern engineering and IT tools.
DS429T.4-PO6	2	Evaluate and implement advanced Big Data analytics techniques like machine learning and predictive analytics using frameworks such as Pig, HiveQL, Zookeeper, and IBM Infosphere to apply reasoning informed by the contextual knowledge.
DS429T.4-PO7	2	Evaluate and implement advanced Big Data analytics techniques like machine learning and predictive analytics using frameworks such as Pig, HiveQL, Zookeeper, and IBM Infosphere to understand the impact of professional engineering solutions in societal and environmental contexts

DS429T.4-PO12	2	Evaluate and implement advanced Big Data analytics techniques like machine learning and predictive analytics using frameworks such as Pig, HiveQL, Zookeeper, and IBM to engage in independent and life-long learning in the broadest context of technological change.
DS429T.4- PSO1	2	Evaluate and implement advanced Big Data analytics techniques like machine learning and predictive analytics using frameworks such as Pig, HiveQL, Zookeeper, and IBM to provide Information Technology based Solutions into user environment through currents trends, technologies and practices.
DS429T.4- PSO2	2	Evaluate and implement advanced Big Data analytics techniques like machine learning and predictive analytics using frameworks such as Pig, HiveQL, Zookeeper, and IBM to provide platform to obtain position in Information Technology such as researcher, developer, analyst, tester and administrator in both Government and Private sector.