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

EVEN SEMESTER

CO-PO-PSO FOURTH SEMESTER

Course Name: Probability statistics and Linear Programming **Course Code: (BS 202)**

At the end of the course, student will be able to

CO	Statement	Blooms Level
BS202.1	To understand and analyze probability and statistical modelling	Understand
BS202.2	Ability to analyze and understand data summarize and sampling theory	Analyze
BS202.3	Ability to apply test for hypothesis, correlation and regression in real life statistical models.	Apply
BS202.4	To understand and apply the concept of linear programming problems and able to create linear models	Design

COs-POs matrices

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

Justification of CO-PO mapping

Mapping	LOW/ MEDIUM/ HIGH	Justification
BS202.1-PO1	MEDIUM	The concept of basic probability is acquired for finding the solution of major engineering problems. It's essential in areas like Quality Control, Risk Assessment, System Reliability, and Data Analysis..
BS 202.1-PO2	MEDIUM	The knowledge of probability and statistical analysis are adopted to identify the consequential responsibilities relevant to professional engineering practices.
BS 202.1-PO3	LOW	The concept of probability needed in managing projects and in multidisciplinary environments.
BS 202.1-PO4	LOW	The Comprehension of random variables and joint probability are needed for finding the solution of complex engineering problems.
BS 202.1-PO6	MEDIUM	Numerical summaries of data helps to understand the latest technologies, software tools and their limitations for

		modelling in complex engineering activities like data handling, data mining.
BS 202.1-PO10	LOW	The knowledge of probability distributions are adopted to identify the consequential responsibilities relevant to professional engineering practices.
BS 202.1-PO11	LOW	The Knowledge of random variables and distributions are important for finding the solution of complex real life problems which are helpful in managing projects and in Multidisciplinary environments.
BS 202.1-PO12	MEDIUM	The analysis technique of the given random variables be applied in the broadest context of technological change.
BS 202.2-PO2	LOW	Various data analysis technique in statistical methods are used to conduct investigations of complex engineering problems
BS 202.2-PO3	LOW	The data analysis technique is helpful in managing projects and in multidisciplinary environments of complex engineering problems.
BS 202.2-PO4	LOW	Different techniques of sampling distribution are analysing the role in engineering field like dynamical systems, risk analysis, quality testing etc.
BS 202.2-PO5	LOW	To interpretation of the data, performing the analysis and drawing the conclusions in various research related problems, fundamental knowledge of statistical techniques are required.
BS 202.2-PO7	MEDIUM	The data summaries techniques are also needful for preparation and ability to engage in independent and life-long learning in the broadest context of technological change
BS 202.2-PO9	MEDIUM	Methods of central limit theorem for finding the solution of engineering problem function effectively as an individual or in diverse teams.
BS 202.2-PO10	LOW	The numerical integration and numerical differentiation very needful for designing solutions to engineering problems and develop solutions that meet the specific needs of society.
BS 202.2-PO11	LOW	Logics related with statistical tools like covariance and correlation are used for designing solutions to many multidisciplinary settings.
BS 202.2-PO12	MEDIUM	Exact sampling distributions are used to analyse data related to environmental factors such as pollution levels, climate change, and ecological trends.
BS 202.3-PO2	LOW	Hypothesis testing are used to determine the effectiveness of a new product in manufacturing fields.
BS 202.3-PO3	MEDIUM	Logics related with numerical methods are used for designing solutions to engineering problems and develop solutions that meet the specific needs of society.
BS 202.3-PO4	MEDIUM	Regression allows researchers to predict or explain the variation in one variable based on another variable. This allows the best interpretation of large data set.

BS 202.3-PO5	LOW	Regression technique also helps to work on the latest technologies, resources and software tools including prediction and modelling to complex engineering activities
BS 202.3-PO6	MEDIUM	The knowledge of testing of hypothesis is adopted to identify the consequential responsibilities relevant to professional engineering practices
BS 202.3-PO9	LOW	Regression has a wide range of real life applications. In correlating and developing a relation between two different data set it is widely used.
BS 202.3-PO11	MEDIUM	The investigation of statistical constants for various probability distributions is widely used for the solution of complex engineering problems
BS 202.3-PO12	MEDIUM	Various LPP techniques are also helpful to research-based knowledge and research methods, including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
BS 202.4-PO2	HIGH	The transportation technique also very effectively 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, and give and receive clear instructions.
BS 202.4-PO3	HIGH	LPP techniques are also helps for the analysis of engineering problems and develop solutions that meet the specific needs of society.
BS 202.4-PO4	LOW	Linear programming problems are helps to design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
BS 202.4-PO5	LOW	Linear programming problems also helps to work on the latest technologies, resources and software tools including prediction and modelling to complex engineering activities
BS 202.4-PO9	MEDIUM	Linear programming problems are very effective to work in multidisciplinary field of engineering and sciences as individual or teams work.
BS 202.4-PO10	HIGH	Mathematical programming 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
BS 202.4-PO11	MEDIUM	The Knowledge of Linear programming problem are important for finding the solution of complex engineering problems which are helpful in managing projects and in Multidisciplinary environments

Mapping	LOW/ MEDIUM/ HIGH	Justification
BS 202.1-PSO1	HIGH	Concepts of probability and statistics helps in analysing and designing of circuits.
BS 202.2-PSO1	HIGH	Fundamental knowledge statistical techniques forms the basis of computer engineering problems encountered in research industry and designing of engineering circuits.
BS 202.2-PSO2	MEDIUM	Fundamental knowledge statistical methods are helpful in understanding the role of devices in communication.
BS 202.3-PSO2	HIGH	The fundamental knowledge of statistical data interpretation required functionality in Communication systems.
BS 202.4-PSO2	HIGH	Linear programming approaches tools are much capable to design and analyse circuits for analog and digital systems.

Subject: Theory of Computation   Subject Code: CIC 206

Course Outcomes:

At the end of the course student will be able to:		PO/ PSO	Bloom Level
CIC-206.1	Ability to understand the design aspects of “abstract models” of computers like finite automata, pushdown automata, and Turing machines.	PO1, PO2,PO3,PO4,PO5,PO9,PO10,PO11,PO12, PSO1, PSO2	**L2: Understand, L3: Apply, L6: Create**
CIC-206.2	Ability to comprehend the recognizability (decidability) of grammar (language) with specific characteristics through these abstract models.	PO1, PO2,PO3,PO4,PO5,PO9,PO10,PO11,PO12, PSO1, PSO2	**L2: Understand, L3: Apply**
CIC-206.3	Ability to decide what makes some problems computationally hard and others easy?	PO1, PO2,PO3,PO4,PO5,PO9,PO10,PO11,PO12, PSO1, PSO2	**L1: Remember, L5: Evaluate**
CIC-206.4	An ability to deliberate the problems that can be solved by computers and the ones that cannot?	PO1, PO2,PO3,PO4,PO5,PO9,PO10,PO11,PO12,PSO1, PSO2	**L4: Analyze**

CO-PO Mapping

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CIC-206.1	3	2	2	2	2				2	1	1	3	3	2
CIC-206.2	3	2	2	2	2				2	1	1	3	2	2
CIC-206.3	3	2	2	2	2				2	1	1	3	2	2
CIC-206.4	3	2	2	2	2				2	1	1	3	3	3

1=Slightly, 2=moderately, 3=substantially

Justification:

Mapping	LOW/ MEDIUM/ HIGH	Justification
CIC-206-PO1	3	Knowledge of the concept of P, NP, Co-NP classes, Finite Automata (DFA and NDFA), Turing machines can be used for the solution of complex engineering problems.
CIC206.1-PO5	2	The concept of P, NP, Co-NP classes, Finite Automata (DFA and NDFA), Mealy/Moore machines, pushdown automata (PDA), Turing machines can be applied to complex engineering activities with an understanding of the limitations
CIC206.1-PSO1	2	The concept of P, NP, Co-NP classes, Finite Automata (DFA and NDFA), Mealy/Moore machines, pushdown automata (PDA), Turing machines can be used to provide Information Technology based Solutions into user environment through currents trends, technologies, and practices.
CIC 206.2-PO1	3	Finite automata concepts to design DFA, regular expressions and their minimized versions can be applied for the solution of complex engineering problems.
CIC 206.2-PO2	3	Finite automata concepts to design DFA, regular expressions are used to identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions.
CIC 206.2-PO3	2	Finite automata concepts to design DFA, regular expressions and their minimized versions can be used for designing 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.
CIC 206.2-PSO1	3	Finite automata concepts to design DFA, regular expressions and their minimized versions provide Information Technology based Solutions into user environment.
CIC 206.3-PO2	3	Automata concepts for categorizing languages as regular, decidable or CFG can be used to identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions.
CIC 206.3-PSO1	1	Automata concepts for categorizing languages as regular, decidable or CFG provide Information Technology based Solutions into user environment through currents trends, technologies, and practices.
CIC 206.4-PO1	2	With knowledge of simplifying the context free grammar to resolve ambiguity property, complex engineering problems can be solved

CIC 206.4-PO2	3	Concept of simplifying the context free grammar can be used identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions.
CIC 206.4-PO4	3	With knowledge of simplifying the context free grammar to resolve ambiguity property we can provide valid conclusions.

Department of Information Technology

3.1.1 Course Name: DBMS **Course Code: (CIC 210)**

At the end of the course student will be able to:-

CO	Statements	Bloom Level
CIC210.1	Ability to understand advantages of database systems	**Remember, Understand**
CIC210.2	Ability to use SQL as DDL, DCL and DML	**Understand , Apply, Analyze**
CIC210.3	Ability to design database and manage transaction processing	**Analyze , Evaluate**
CIC210.4	Understand object oriented & distributed databases systems and use them	**Understand ,Create**

3.1.2. CO-PO matrices

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

Note: Enter correlation levels 1, 2 or 3 as defined below 1: Slight (Low) 2: Moderate (Medium)

3: Substantial (High)

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	LOW/MEDIM/ HIGH	**Justification**
CIC210.1-PO1	HIGH	The students will be able to determine the requirements of the real world database applications with some knowledge of engineering fundamentals to design conceptual schema.
CIC210.1-PO2	MEDIUM	Able to identify, formulate, review, and analyze real world problems to define the conceptual data base using the principles of mathematics and engineering sciences
CIC210.1-PO3	MEDIUM	A Database designer can able to design a conceptual schema for understanding the Entities, Attributes and Relationships of the real world problem.

CIC210.1-PO4	MEDIUM	A Database user can understand problem with the help of research-based knowledge and research Methods.
CIC210.1-PO5	MEDIUM	The student becomes well versed in using oracle tool (SQL PLUS) for designing database solutions.
CIC210.1-PO12	HIGH	Moderately mapped as students can identify the changing trends in engineering knowledge by building a database for any application.
CIC210.1-PSO1	HIGH	A user can understand the problem aand provide the solution with the latest technology
CIC210.1-PSO2	MEDIUM	The researcher, developer, analyst, tester and administrator able to solve database problem
CIC210.2-PO1	HIGH	The student is able to construct the database using any SQL commands.
CIC210.2-PO2	MEDIUM	The Students can develop database applications with SQL to interact with the database.
CIC210.2-PO3	MEDIUM	Students will be able to understand the formulation and working of SQL queries
CIC210.2-PO4	MEDIUM	A Database designer can choose appropriate procedure, data set and test cases to analyze data and build a valid database.
CIC210.2-PO5	MEDIUM	Able to use modern tools to interact with the database using basic SQL commands.
CIC210.2-PO9	HIGH	With the change of technologies students will be able to adopt themselves with different SQL versions
CIC210.2-PO10	MEDIUM	relational Model and SQL Programming Communicate effectively 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, and give and receive clear instructions.

CIC210.2-PO11	MEDIUM	Demonstrate knowledge and understanding of the relational Model and SQL Programming apply these to manage projects and in multidisciplinary environments.
CIC210.2-PO12	HIGH	The researcher and administrator able to solve problem with the SQL queries.
CIC210.2-PSO1	MEDIUM	To introduce the career based solution with help of PL/SQL
CIC210.2-PSO2	MEDIUM	Develop an application software using SQL commands
CIC210.3-PO1	HIGH	Able to write SQL queries with knowledge stored procedures, triggers to interact with the designed database application
CIC210.3-PO2	MEDIUM	Students will be able to classify different indexing schemes used in retrieval
CIC210.3-PO3	MEDIUM	Students gain competency in PL/SQL programming
CIC210.3-PO4	MEDIUM	A Database designer can choose appropriate database connectivity to interact with a database/database component
CIC210.3-PO5	HIGH	Students will be able to apply proper normalization for developing well-tuned database
CIC210.3-PO9	HIGH	With the change of normalization schemes students will be able to adopt themselves with different SQL.
CIC210.3-PO10	MEDIUM	Students can able to choose appropriate concurrency control techniques and recovery protocols in database.
CIC210.3-PO11	MEDIUM	Students can analyze the transactions to achieve feasibility, viability and sustainability.
CIC210.3-PO12	HIGH	Students are able to design and provide information in terms of transaction processing

CIC210.3-PSO1	MEDIUM	The researcher able design to solve database problem and provide transaction process
CIC210.3-PSO2	HIGH	Design a serializable transaction of a database application.
CIC210.4-PO1	HIGH	Students will be able to identify different normalization procedures used in database design
CIC210.4-PO2	HIGH	Students will gain knowledge in classifying different normal forms
CIC210.4-PO3	MEDIUM	Slightly mapped as the students will be able to apply appropriate techniques
CIC210.4-PO4	HIGH	Student will able to use concepts and design methods for analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
CIC210.4-PO5	HIGH	Student are able to apply and Create and apply appropriate OODB techniques and IT tools including prediction and modeling to complex engineering
CIC210.4-PO9	HIGH	Moderately mapped as the students will be able to demonstrate the knowledge OODB and distributed Database logics.
CIC210.4-PO10	MEDIUM	Students ae able to communicate effectively on engineering activities with OODB and Distributed DB; able to comprehend and write effective reports and design documentation.
CIC210.4-PO11	MEDIUM	Students can understand and use the Object oriented Distributed DB systems
CIC210.4-PO12	HIGH	Slightly mapped as the students will be able to engage in lifelong learning.
CIC210.4-PSO1	HIGH	Students can understand and use the Object oriented Distributed DB systems
CIC210.4-PSO2	MEDIUM	Students can understand and solve research based problems with he Object oriented Distributed DB systems

Department of Information Technology

CO's with Bloom Level Mapping

Course: **Programming in Java** **Paper Code:** **CIC-212**

Course Outcome (COs)	CO's Statements	Bloom Level
CIC-212.1	Students will recall Java language features, understand the compilation process, and explain JVM organization, emphasizing key security aspects.	L1 – Remember L2 – Understand
CIC-212.2	Apply Java fundamentals to design secure applications, analyze class loaders for dynamic loading, and implement security measures effectively.	L3 – Apply L4 – Analyze
CIC-212.3	Apply advanced Java concepts in creating multithreaded applications, evaluate AWT components for GUI development, and proficiently handle diverse AWT events.	L3 – Apply L5 – Evaluate
CIC-212.4	Create robust Java applications using I/O streams, JDBC for database connectivity, and design client-server applications with sockets, demonstrating proficiency in JNI-based development.	L6 – Create L5 – Evaluate

CO-PO-PSO Mapping

Course: **Programming in Java** **Paper Code:** **CIC-212**

Program Outcomes (POs):

1. **Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.**
2. **Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.**
3. **Design/development of solutions: 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.**
4. **Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems.**
5. **Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.**
6. **The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.**
7. **Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.**
8. **Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.**

9. **Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.**
10. **Communication: Communicate effectively 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, and give and receive clear instructions.**
11. **Project management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.**
12. **Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.**

Program Specific Outcomes (PSOs):

1. **PSO1: To provide Information Technology based Solutions into user environment through currents trends, technologies and practices.**
2. **PSO2: To provide platform to obtain position in Information Technology such as researcher, developer, analyst, tester and administrator in both Government and Private sector.**

Course Outcome (COs)	CO's Statements	PO / PSO
CIC-212.1	Students will recall Java language features, understand the compilation process, and explain JVM organization, emphasizing key security aspects.	PO1, PO4, PO3, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2
CIC-212.2	Apply Java fundamentals to design secure applications, analyze class loaders for dynamic loading, and implement security measures effectively.	PO1, PO3, PO4, PO5, PO6, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2
CIC-212.3	Apply advanced Java concepts in creating multithreaded applications, evaluate AWT components for GUI development, and proficiently handle diverse AWT events.	PO1, PO3, PO4, PO5, PO9, PO10, PO11, PO12, PSO1, PSO2
CIC-212.4	Create robust Java applications using I/O streams, JDBC for database connectivity, and design client-server applications with sockets, demonstrating proficiency in JNI-based development.	PO1, PO3, PO4, PO5, PO8, PO9, PO10, PO11, PO12, PSO1, PSO2

CO-PO-PSO Mapping Table

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

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

CO-PO-PSO Justification

CO No.	PO	Level	Justification
CIC-212.1	PO1	3	CO1 strongly aligns with PO1 by demonstrating the application of engineering knowledge in understanding Java fundamentals and JVM organization.
	PO3	3	CO1 strongly aligns with PO3 as understanding the compilation process and JVM organization contributes to designing solutions for complex engineering problems.
	PO4	3	CO1 strongly aligns with PO4 as it involves research-based investigation and analysis of Java-related issues, particularly focusing on security aspects.
	PO5	3	CO1 strongly aligns with PO5 by emphasizing the use of modern engineering tools, including understanding Java language features and compilation process.
	PO6	3	CO1 strongly aligns with PO6 as emphasizing key security aspects in JVM organization aligns with assessing societal issues and responsibilities in engineering practice.
	PO7	3	CO1 strongly aligns with PO7, albeit indirectly, as understanding security aspects contributes to the broader understanding of cybersecurity and its impact on society.
	PO8	3	CO1 strongly aligns with PO8 as understanding security aspects involves considerations of ethical principles and responsibilities in engineering practice.
	PO9	3	CO1 strongly aligns with PO9 as the knowledge of Java language features and JVM organization is crucial for both individual work and collaboration in software development teams.
	PO10	3	CO1 strongly aligns with PO10 as effective communication about Java language features, compilation process, and JVM organization is essential within the engineering community and with stakeholders.
	PO11	3	CO1 strongly aligns with PO11 as proficiency in Java language features and understanding JVM organization contributes to effective project management in software development projects.
	PO12	3	CO1 strongly aligns with PO12 as learning about Java language features and JVM organization prepares students for continuous learning in the evolving field of software engineering.
CIC-212.2	PO1	3	CO2 strongly aligns with PO1 by demonstrating the application of engineering knowledge in designing secure applications and implementing security measures.
	PO3	3	CO2 strongly aligns with PO3 as applying Java fundamentals involves designing solutions for complex engineering problems, particularly emphasizing security aspects.
	PO4	3	CO2 strongly aligns with PO4 as it involves research-based investigation and analysis of Java-related issues, specifically focusing on security measures and dynamic loading of class loaders.
	PO5	3	CO2 strongly aligns with PO5 by demonstrating the use of modern engineering tools, including applying Java fundamentals to design secure applications and implement security measures.
	PO6	3	CO2 strongly aligns with PO6 as designing secure applications and implementing security measures aligns with assessing societal issues and responsibilities in engineering practice, particularly in ensuring data privacy and security.
	PO7	3	CO2 strongly aligns with PO8 as implementing security measures involves considerations of ethical principles and responsibilities in engineering practice, particularly in safeguarding user data and privacy.
	PO8	3	CO2 strongly aligns with PO9 as applying Java fundamentals and implementing security measures can be done both individually and as part of software development teams.

	PO9	3	CO2 strongly aligns with PO10 as effective communication about the design and implementation of secure applications is essential for collaboration within the engineering community and with stakeholders.
	PO10	3	CO2 strongly aligns with PO11 as proficiency in applying Java fundamentals contributes to effective project management in software development projects.
	PO11	3	CO2 strongly aligns with PO12 as learning to design secure applications and implement security measures prepares students for continuous learning in the evolving field of cybersecurity and software engineering.
	PO12	3	CO2 strongly aligns with PO1 by demonstrating the application of engineering knowledge in designing secure applications and implementing security measures.
CIC-212.3	PO1	3	CO3 strongly aligns with PO1 by demonstrating the application of engineering knowledge in creating multithreaded applications and handling AWT events.
	PO3	3	CO3 strongly aligns with PO3 as applying advanced Java concepts involves designing solutions for complex engineering problems, particularly in creating multithreaded applications and GUI development.
	PO4	3	CO3 strongly aligns with PO4 as evaluating AWT components and handling diverse AWT events require research-based investigation and analysis of Java-related issues.
	PO5	3	CO3 strongly aligns with PO5 by demonstrating the use of modern engineering tools, including proficiency in advanced Java concepts and AWT component evaluation.
	PO9	2	CO3 moderately aligns with PO9 as applying advanced Java concepts can be done both individually and as part of software development teams.
	PO10	2	CO3 moderately aligns with PO10 as effective communication about the design and implementation of multithreaded applications and GUI development is essential for collaboration within the engineering community and with stakeholders.
	PO11	2	CO3 moderately aligns with PO11 as proficiency in advanced Java concepts contributes to effective project management in software development projects.
	PO12	2	CO3 moderately aligns with PO12 as learning advanced Java concepts prepares students for continuous learning in the evolving field of software engineering and technology.
CIC-212.4	PO1	3	CO4 strongly aligns with PO1 by demonstrating the application of engineering knowledge in creating robust Java applications and designing client-server applications.
	PO3	3	CO4 strongly aligns with PO3 as creating robust Java applications involves designing solutions for complex engineering problems, particularly in client-server application design and database connectivity.
	PO4	3	CO4 strongly aligns with PO4 as creating robust Java applications requires research-based investigation and analysis of Java-related issues, specifically focusing on I/O streams, JDBC usage, and JNI-based development.
	PO5	3	CO4 strongly aligns with PO5 by demonstrating the use of modern engineering tools, including proficiency in Java I/O streams, JDBC, and sockets.
	PO8	2	CO4 moderately aligns with PO8 as designing client-server applications and ensuring data integrity and security through JDBC usage involves considerations of ethical principles and responsibilities in engineering practice.
	PO9	2	CO4 moderately aligns with PO9 as creating Java applications and designing client-server applications can be done both individually and as part of software development teams.
	PO10	2	CO4 moderately aligns with PO10 as effective communication about the design and implementation of robust Java applications is essential for collaboration within the engineering community and with stakeholders.

	PO11	2	CO4 moderately aligns with PO11 as proficiency in creating Java applications contributes to effective project management in software development projects.
	PO12	2	CO4 moderately aligns with PO12 as learning to create robust Java applications prepares students for continuous learning in the evolving field of software engineering and technology.

CO-PO-PSO SIX SEMESTER

Department of Information Technology

3.1.1 Course Name: Principles of Management for Engineers Course Code: (MS-302)

At the end of the course, student will be able to

CO	Statement	Bloom Level(s)
MS 302.1	Remember and understand the relevance of the political, legal, ethical, economic and cultural environments in global business	L1 – Remember L2- Understand
MS 302.2	To apply the approaches to goal setting, planning and organizing in a variety of circumstances.	L3- Apply
MS 302.3	To evaluate contemporary approaches for staffing and leading in an organization	L5 - Evaluate
MS 302.4	To analyze contemporary issues in controlling for measuring organizational performance.	L4- Analyze

3.1.2. CO-PO matrices

CO. No	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	-	2	-	1	1	2	3	2	2	2
CO2	2	2	1	-	-	2	-	1	1	2	3	2	3	3
CO3	2	3	-	3	-	2	-	-	1	2	3	2	3	3
CO4	2	3	-	2	-	2	-	-	-	2	3	2	2	3

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

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
CO1-PO1	MEDIUM	Understanding engineering principles is crucial to analyze global business environments.
CO1-PO2	MEDIUM	Problem-solving skills are needed to evaluate and adapt to complex global factors.
CO1-PO3	-	Designing solutions is not the focus here.
CO1-PO4	-	Investigation skills are not directly related to this CO.
CO1-PO5	-	Modern tool usage is not directly relevant.
CO1-PO6	MEDIUM	Societal impact evaluation is important in understanding global business decisions.
CO1-PO7	-	Considering environmental sustainability is not the primary focus.

CO1-PO8	LOW	Ethical considerations are important in global business contexts.
CO1-PO9	MEDIUM	Teamwork and leadership are needed to understand and implement global business strategies.
CO1-PO10	HIGH	Clear communication and reporting in a global context are crucial.
CO1-PO11	MEDIUM	Understanding project management and finance in global business is essential.
CO1-PO12	HIGH	Comprehensive understanding of management principles is crucial.
CO1-PSO1	MEDIUM	Applying computational mathematics to global business challenges helps in better decision making.
CO1-PSO2	MEDIUM	Designing applications with professional and social ethics is important for global business.
CO2-PO1	MEDIUM	Basic engineering knowledge helps in understanding and developing planning approaches.
CO2-PO2	LOW	Problem-solving is essential for effective planning and organizing but is not the primary focus.
CO2-PO3	-	Designing solutions is not the main objective here.
CO2-PO4	-	Investigation skills are not directly applicable.
CO2-PO5	MEDIUM	Using modern tools aids in effective planning and organizing.
CO2-PO6	MEDIUM	Considering societal impacts is important for successful planning and organizing.
CO2-PO7	-	Environmental issues are not the focus.
CO2-PO8	-	Ethical considerations are not directly relevant.
CO2-PO9	MEDIUM	Teamwork and leadership skills are important for organizing efforts.
CO2-PO10	HIGH	Clear communication is vital for goal setting, planning, and organizing.
CO2-PO11	MEDIUM	Effective project management and finance are essential for planning and organizing.
CO2-PO12	HIGH	Comprehensive understanding of management principles is critical for planning and organizing.
CO2-PSO1	HIGH	Applying computational mathematics helps in effective planning and organizing.
CO2-PSO2	HIGH	Designing and developing tools for planning and organizing is important.
CO3-PO1	MEDIUM	Understanding basic engineering principles aids in evaluating staffing approaches.
CO3-PO2	HIGH	Problem-solving is crucial for effective staffing and leadership.
CO3-PO3	-	Designing solutions is not the primary focus.
CO3-PO4	HIGH	Complex organizational dynamics require strong investigative skills.
CO3-PO5	-	Modern tool usage is not the primary focus.

CO3-PO6	-	Societal impacts are not directly relevant.
CO3-PO7	-	Environmental issues are not the focus.
CO3-PO8	MEDIUM	Ethical considerations are important in staffing and leadership.
CO3-PO9	MEDIUM	Teamwork and leadership skills are crucial for staffing and leading effectively.
CO3-PO10	LOW	Clear communication is necessary but not the primary focus.
CO3-PO11	MEDIUM	Project management and finance are important for staffing and leadership.
CO3-PO12	HIGH	Comprehensive understanding of management principles is crucial.
CO3-PSO1	HIGH	Using computational mathematics helps in addressing staffing challenges.
CO3-PSO2	HIGH	Monitor and Build skills are essential for staffing , leadership and Management.
CO4-PO1	MEDIUM	Basic engineering principles help in understanding control systems.
CO4-PO2	HIGH	Problem-solving is crucial for addressing control issues.
CO4-PO3	-	Designing solutions is not the primary focus.
CO4-PO4	MEDIUM	Investigative skills are needed to design effective control systems.
CO4-PO5	-	Modern tool usage is not directly relevant.
CO4-PO6	MEDIUM	Considering societal impacts is important for control systems.
CO4-PO7	-	Environmental issues are not the focus.
CO4-PO8	-	Ethical considerations are not directly relevant.
CO4-PO9	MEDIUM	Teamwork and leadership skills are needed for implementing control systems.
CO4-PO10	HIGH	Clear communication is vital for control systems.
CO4-PO11	MEDIUM	Project management and finance are essential for control systems.
CO4-PO12	HIGH	Comprehensive understanding of management principles is crucial.
CO4-PSO1	MEDIUM	Applying computational mathematics helps in developing control systems.
CO4-PSO2	HIGH	Designing control systems with professional and social ethics is important.

Department of Instrumentation & Control Engineering

3.1.1 Course Name: Universal Human Values **Course Code:** (HS-304**)**

At the end of the course, student will be able to

CO	Statement	Bloom Level(s)
HS-304.1	Define values and skills, happiness and accumulation of physical facilities and describe the self and the body, intention and competence of an individual etc.	Remember, Understanding
HS-304.2	Examine the role of a human being in ensuring harmony in society and nature.	Analyze
HS-304.3	Apply the understanding of ethical conduct to formulate the strategy for ethical life and profession.	Apply, Create
HS-304.4	Evaluate the significance of value inputs in formal education and start applying them in their life and profession	Evaluate, Apply

3.1.2. 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
CO1	-	-	-	-	-	3	-	3	1	1	-	1	1	-
CO2	-	-	-	-	-	3	-	3	1	1	-	1	1	1
CO3	-	-	-	-	-	3	-	3	1	1	-	1	1	1
CO4	-	-	-	-	-	3	-	3	1	1	-	1	1	-

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

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

If there is no correlation, put "-"

CO-PO-PSO Justification

CO No.	PO	Level	Justification
CO1	PO6	3	Understanding values and skills, happiness, and physical facilities is crucial for engineers to make informed decisions that benefit society.
	PO8	3	Defining values ties directly into ethical principles guiding professional conduct.
	PO9	1	Understanding self, body, intention, and competence helps in effective individual and teamwork.
	PO10	1	Competence in communication is enhanced by a clear understanding of self and others.
	PO12	1	Continuous evaluation of personal values and skills is essential for life-long learning.
	PSO1	1	Knowledge of values and skills is integral to applying discipline-specific skills in an ethical manner.
CO2	PO6	3	Engineers play a crucial role in promoting societal harmony through their actions and decisions.
	PO8	3	Ensuring harmony in society and nature is a fundamental ethical responsibility.
	PO9	1	Understanding societal and environmental impacts aids in collaborative efforts.
	PO10	1	Effective communication is necessary to advocate for societal and environmental harmony.
	PO12	1	Addressing societal and environmental challenges requires continuous learning and adaptation.
	PSO1	1	Promoting harmony involves applying discipline-specific knowledge to societal and environmental contexts.
	PSO2	1	Understanding the societal role of the profession enhances its practice.
CO3	PO6	3	Ethical conduct is vital in addressing societal issues responsibly.
	PO8	3	Formulating ethical strategies is core to professional ethics.
	PO9	1	Ethical conduct fosters trust and cooperation in teams.
	PO10	1	Communicating ethical standards and practices clearly is essential.
	PO12	1	Ethical challenges evolve, necessitating life-long learning.
	PSO1	1	Discipline-specific ethical applications are critical for professional integrity.
	PSO2	1	Understanding and applying ethical principles within the profession is essential.
CO4	PO6	3	Value inputs in education lead to socially responsible engineering practice.
	PO8	3	Ethical education instills fundamental values in professionals.
	PO9	1	Value-based education enhances teamwork through shared ethical standards.
	PO10	1	Clear communication of values enhances their application in professional settings.
	PO12	1	Emphasizing values in education supports continuous ethical development.
	PSO1	1	Integrating values into discipline-specific education ensures comprehensive professional competence.

Department of Information Technology

Subject: Programming in Python Subject Code: CIC-332T

CO	Course Outcome	Bloom's Level
1	Demonstrate the concepts of control structures in Python.	L1-Remember L2-Understand
2	Implement Python programs using functions and strings.	L2-Understand L3-Apply L4-Analyze
3	Implement methods to create and manipulate lists, tuples and dictionaries	L5- Evaluate L6-Create
4	Apply the concepts of file handling and regExusing packages.	L4-Analyze L5- Evaluate L6-Create

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	3	2	2	2	3				3	2	2	3	1	1
CO2	3	2	2	2	3				3	2	2	3	1	2
CO3	3	2	2	2	3				3	2	2	3	2	2
CO4	3	2	2	2	3				3	2	2	3	3	3

JUSTIFICATIONS FOR CO-PO/PSO MAPPING

Mapping	Low/Medium/ High	Justifications
C332.1-PO1	3	Strong foundational knowledge of programming structures is required.
C332.1-PO2	2	Involves logical thinking to structure control flows effectively.
C332.1-PO3	2	Used in designing structured and efficient Python programs.
C332.1-PO4	2	Basic debugging and analysis of control structures.
C332.1-PO5	3	Python is a widely used modern programming tool.
C332.1-PO9	3	Control structures are fundamental for collaborative programming tasks.
C332.1-PO10	2	Coding practices require clear documentation and explanation.
C332.1-PO11	2	Control structures impact software efficiency, influencing project cost and management.
C332.1-PO12	3	Continuous updates in programming paradigms require lifelong learning.
C332.1-PSO1	1	Supports basic IT-based solutions.
C332.1-PSO2	1	Useful for roles in development and automation.
C332.2-PO1	3	Requires strong programming concepts in functions and string manipulation.
C332.2-PO2	2	Involves analyzing string-related problems and function design.
C332.2-PO3	2	Helps in structuring modular and reusable Python programs.
C332.2-PO4	2	Debugging and testing functions and string operations.
C332.2-PO5	3	Essential in modern software applications.
C332.2-PO9	3	Functions enhance team collaboration through modular programming.

C332.2-PO10	2	Understanding function-based programming requires clear documentation.
C332.2-PO11	2	Modular programming improves maintainability and cost-effectiveness.
C332.2-PO12	3	Continuous learning required for new Python features and libraries.
C332.2-PSO1	1	Applicable for IT-based solutions in data processing.
C332.2-PSO2	2	Strong relevance for software development roles.
C332.3-PO1	3	Strong fundamental programming knowledge is needed.
C332.3-PO2	2	Requires selecting appropriate data structures for different problems.
C332.3-PO3	2	Helps in designing efficient data storage solutions.
C332.3-PO4	2	Involves debugging and performance analysis.
C332.3-PO5	3	Python's built-in data structures are widely used in modern computing.
C332.3-PO9	3	Data structures play a crucial role in team projects.
C332.3-PO10	2	Requires explaining and documenting data-handling methods
C332.3-PO11	2	Data management is crucial in software project planning.
C332.3-PO12	3	New data structures and optimization techniques are continuously evolving.
C332.3-PSO1	2	Strongly supports IT-based problem-solving.
C332.3-PSO2	2	Essential for careers in data science, software development, and system analysis.
C332.4-PO1	3	Requires advanced understanding of file handling and text processing.
C332.4-PO2	2	Involves parsing and analyzing complex textual data.
C332.4-PO3	2	Used in designing efficient file handling and text-processing solutions.
C332.4-PO4	2	Includes debugging and pattern matching in files.
C332.4-PO5	3	Regular expressions and file handling are crucial in modern applications.
C332.4-PO9	3	Used in collaborative data analysis and automation projects.
C332.4-PO10	2	File handling and regex require proper documentation and explanation.
C332.4-PO11	2	Managing large-scale data files is crucial in business projects.
C332.4-PO12	3	Regular expressions and file-handling methods evolve with programming advancements.
C332.4-PSO1	3	Crucial for IT-based solutions in automation and data processing.
C332.4-PSO2	3	Strongly relevant for roles in system administration, data analytics, and cybersecurity.

Course Name: Web Technologies Course Code: (CIE- 356T)

At the end of the course, student will be able to

CO	Statement	Bloom Level(s)
CIE-356T.1	Understand the concepts of HTML5, CSS, JavaScript, XML, PHP and develop JavaScript programs.	L1 Remember L2-Understand
CIE-356T.2	Understand various concepts related to dynamic web pages and validate them using JavaScript and JSP	L2-Understand L3-Apply L4-Analysis
CIE-356T.3	Outline and understand the concepts of PHP for Web Development and Implement the concept of Session and Cookies for Login System.	L2-Understand L5-Evaluate L3-Apply
CIE-356T.4	Apply advance concepts of web APIs to build web projects in multidisciplinary environments and Implement the concept for creating content based dynamic web applications.	L3-Apply L6-Create

CO-PO matrices

Course Outcomes	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
CO1	-	-	3	-	-	2	-	2	2	-	3	2	-	3
CO2	-	-	2	-	-	-	2	-	-	3	-	-	-	2
CO3	-	-	-	2	3	-	-	3	-	-	2	-	1	-
CO4	3	-	3	-	-	3	3	-	3	-	-	3	1	2

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

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

If there is no correlation, put“-”

Mapping	LOW/MEDI UM/ HIGH	Justification
CIE- 356T.1.- PO3	HIGH	Knowledge for Web Technology has to be upgraded throughout the life due to advent of new challenges / opportunities / problems
CIE- 356T.1- PO6	MEDIUM	The intersection of engineering and society is profoundly impactful in the realm of web technology. Engineers, particularly those specializing in web technology, play a crucial role in shaping the digital landscape and, by extension, modern Society
CIE- 356T.1- PO9	MEDIUM	In the field of web technology, both individual and team work play crucial roles, each contributing uniquely to the development, implementation, and maintenance of web-based projects.
CIE- 356T.1- PO11	HIGH	Project management provides a structured framework for planning, executing, and closing projects. It ensures that all aspects of the project are organized and that there is a clear roadmap to follow.
CIE- 356T.1- PO12	MEDIUM	Web technologies evolve quickly, with new frameworks, languages, and tools emerging regularly. Lifelong learning helps professionals stay updated with the latest advancements, ensuring they remain relevant and competitive.
CIE- 356T.1- PSO2	HIGH	Technologies like HTML, CSS, and JavaScript are standardized by organizations such as W3C, ensuring consistent behaviour across different devices and platforms so that they can be optimized.
CIE- 356T.2- PO3	MEDIUM	JavaScript is a high-level, interpreted programming language that is primarily used to create interactive and dynamic web applications. It is a core technology of the World Wide Web, alongside HTML and CSS, and enables developers to enhance user experiences by adding interactivity to static pages
CIE- 356T.2- PO7	MEDIUM	By optimizing code, leveraging modern features, choosing efficient frameworks, and using sustainable hosting solutions, developers can minimize the environmental footprint of their JavaScript applications.
CIE- 356T.2- PO10	HIGH	WebSocket's allow full-duplex communication channels over a single TCP connection, enabling real-time interaction between the client and server.
CIE- 356T.2- PSO2	MEDIUM	JavaScript's versatility, extensive ecosystem, and powerful frameworks make it a compelling choice for developing both software and hardware applications that can be well optimized.
CIE- 356T.3- PO4	MEDIUM	A systematic approach to investigating and resolving server- side programming problems involves understanding the problem, analysing potential causes, exploring solutions, and implementing fixes with thorough testing.
CIE- 356T.3- PO5	MEDIUM	The modern landscape of server-side programming is rich with tools and frameworks that enhance the development process.
CIE- 356T.3- PO8	HIGH	Ethical server-side programming is about more than just writing functional code. It involves a commitment to safeguarding user data, protecting privacy, ensuring fairness and transparency, and taking responsibility for the broader impacts of software

CIE- 356T.3-PO11	HIGH	By combining effective project management practices with robust financial oversight, server-side programming projects can be successfully delivered on time and within budget, meeting both technical and business objectives
CIE- 356T.3-PSO1	LOW	By leveraging these computational mathematics fundamentals and algorithmic strategies, server-side programmers can effectively tackle real-time challenges, ensuring the optimization of applications are efficient, scalable, and reliable.
CIE- 356T.4-PO1	HIGH	By mastering these engineering disciplines, developers can build robust, scalable, and user-friendly web applications that meet the needs of modern users and businesses.
CIE- 356T.4-PO3	HIGH	we can design and develop a successful web application that meets the needs of your users and delivers value to your business or organization.
CIE- 356T.4-PO6	HIGH	By considering these factors and actively engaging with the broader societal context, engineers can contribute to the responsible and sustainable development of web applications that benefit individuals and communities alike.
CIE- 356T.4-P07	HIGH	By adopting sustainable practices and promoting energy efficiency throughout the lifecycle of web applications, developers and businesses can minimize their environmental impact and contribute to a more sustainable digital future
CIE- 356T.4-PO9	HIGH	improve the communication aspect of the web app, ensuring it meets the needs of users and contributes to the overall success of the application.
CIE- 356T.4-P012	HIGH	enhance the effectiveness of the web app's lifelong learning program, empowering users to pursue continuous growth and development throughout their lives.
CIE- 356T.4-PSO1	HIGH	By integrating computational mathematics and algorithmic principles into web app development, developers can tackle complex real-time challenges effectively, and apply the IT tools in analyst/developer roles.
CIE- 356T.4-PSO2	MEDIUM	web technologies provide a versatile and powerful platform for designing and developing software, hardware, and web applications that can be well optimized.

Department of Information Technology

3.1.1 Course Name: Artificial Intelligence **Course Code: AI-302T**

At the end of the course, student will be able to

	Statement	Bloom Level(s)
AI-302T.1	To impart the definition and basic knowledge of Artificial Intelligence.	**L1-Remember L5-Evaluate**
AI-302T.2	To introduces AI by examining the nature of the difficult problems.	**L2-Understand**
AI-302T.3	To understand with AI demonstration that intelligence requires ability to find reason.	**L3-Apply L4-Analyze**
AI-302T.4	To understand the latest techniques and the future scope of the technology.	**L6-Create**

3.1.2. CO-PO matrices

CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
AI-302T.1	3	3	3	3	3	2	2	–	–	–	–	2	3	3
AI-302T.2	3	3	3	3	3	2	2	–	–	–	–	2	3	2
AI-302T.3	3	3	3	3	3	2	2	–	–	–	–	2	3	2
AI-302T.4	3	3	3	3	3	2	2	–	–	–	–	2	3	2

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

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

JUSTIFICATIONS FOR CO-PO MAPPING

Mapping	**UM/ HIGH**	**Justification**
AI-302T.1 -PO1	3	Engineering Knowledge includes basic fundamentals of Artificial Intelligence and its techniques. It involves engineering specialization to solve the complex engineering problems.
AI-302T.1 -PO2	3	Fundamental know-how of computer system components will support lifelong learning. However, with the advancements in technology these fundamentals will keep on enhancing.
AI-302T.1 -PO3	3	Knowledge for Artificial Intelligence has to be upgraded throughout the life due to advent of new challenges / opportunities / problems.

AI-302T.1 –PO4	3	It uses research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems.
AI-302T.1-PO5	3	The Artificial Intelligence technique helps to understand the latest technologies, software tools and their limitations for modelling in complex engineering activities.
AI-302T.1-PO6	2	In-depth knowledge of AI concepts, including machine learning, deep learning, natural language processing, computer vision, robotics, and intelligent systems. This specialized knowledge enables them to understand the capabilities and limitations of AI technologies and apply them effectively to professional engineering practices.
AI-302T.1-PO7	2	AI programs emphasize analytical thinking, logical reasoning, and creative problem-solving skills. These skills are transferable across various domains and can be applied not only to AI-related challenges but also to a wide range of complex problems encountered in personal and professional life-long learning.
AI-302T.1-PO12	2	Artificial Intelligence basics form the fundamentals of computing, which will definitely help in rebuilding any advancements in technology during lifelong learning.
AI-302T.2 -PO1	3	Fundamental know-how search algorithms, heuristic search, CSP problems will support lifelong learning. However, with the advancements in technology these fundamentals will keep on enhancing.
AI-302T.2-PO2	3	Engineering Knowledge includes basic fundamentals of search

AI-302T.2 -PO3	3	Knowledge for Artificial Intelligence has to be upgraded throughout the life due to advent of new challenges / opportunities / problems.
AI-302T.2 –PO4	3	It uses research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems.
AI-302T.2-PO5	3	The Artificial Intelligence search technique helps to understand the searching best solutions for real time problems, software tools and their limitations for modelling in complex engineering activities.
AI-302T.2-PO6	2	In-depth knowledge of AI concepts, including machine learning, deep learning, natural language processing, computer vision, robotics, and intelligent systems. This specialized knowledge enables them to understand the capabilities and limitations of AI technologies and apply them effectively to professional engineering practices.
AI-302T.2-PO7	2	AI programs emphasize analytical thinking, logical reasoning, and creative problem-solving skills. These skills are transferable across various domains and can be applied not only to AI-related challenges but also to a wide range of complex problems encountered in personal and professional life-long learning.

AI-302T.2-PO12	2	Various knowledge representation techniques form the base of Artificial Intelligence, which will definitely help in rebuilding any advancements in technology during lifelong learning.
AI-302T.3 - PO1	3	Fundamental know-how search algorithms, heuristic search, CSP problems will support lifelong learning. However, with the advancements in technology these fundamentals will keep on enhancing.
AI-302T.3-PO2	3	Engineering Knowledge includes basic fundamentals of search algorithms, heuristic search, CSP problems and its techniques. It involves engineering specialization to solve the complex engineering problems.
AI-302T.3 - PO3	3	Knowledge for Artificial Intelligence has to be upgraded throughout the life due to advent of new challenges / opportunities / problems.
AI-302T.3 – PO4	3	It uses research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems.
AI-302T.3-PO5	3	The Artificial Intelligence applications helps to understand the real time problems, software tools and their limitations for modelling in complex engineering activities.

AI-302T.3-PO6	2	In-depth knowledge of AI concepts, including machine learning, deep learning, natural language processing, computer vision, robotics, and intelligent systems. This specialized knowledge enables them to understand the capabilities and limitations of AI technologies and apply them effectively to professional engineering practices.
AI-302T.3-PO7	2	AI programs emphasize analytical thinking, logical reasoning, and creative problem-solving skills. These skills are transferable across various domains and can be applied not only to AI-related challenges but also to a wide range of complex problems encountered in personal and professional life-long learning.
AI-302T.3-PO12	2	Various search algorithm basics form the fundamentals of computing, which will definitely help in rebuilding any advancements in technology during lifelong learning.
AI-302T.4 -PO1	3	Engineering Knowledge includes concepts of game theory, adversial search. It involves engineering specialization to solve the complex engineering problems.
AI-302T.4-PO2	3	Fundamental know-how of game theory and its techniques support lifelong learning. However, with the advancements in technology these fundamentals will keep on enhancing.
AI-302T.4 -PO3	3	Knowledge for game theory has to be upgraded throughout the life due to advent of new challenges / opportunities / problems.
AI-302T.4 –PO4	3	It uses research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems.
AI-302T.4-PO5	3	The Artificial Intelligence Expert system helps to solve many real time problems, software tools and their limitations for modelling in complex engineering activities.
AI-302T.4-PO6	2	In-depth knowledge of AI concepts, including machine learning, deep learning, natural language processing, computer vision, robotics, and intelligent systems. This specialized knowledge enables them to understand the capabilities and limitations of AI technologies and apply them effectively to professional engineering practices.
AI-302T.4-PO7	2	AI programs emphasize analytical thinking, logical reasoning, and creative problem-solving skills. These skills are transferable across various domains and can be applied not only to AI-related challenges but also to a wide range of complex problems encountered in personal and professional life - long learning.
AI-302T.4-PO12	2	Various game theory techniques form the basics of AI, which will definitely help in rebuilding any advancements in technology during lifelong learning.
AI-302T.1-PSO1	3	Understanding of AI fundamentals provide Information Technology based solutions into user environment throughcurrents trends, technologies and practices.
AI-302T.1-PSO2	3	Mastering AI methods and control strategies enables precise problem evaluation, enhancing one's expertise as a researcher, developer, analyst, tester, or administrator. This proficiency is crucial for developing innovative solutions, optimizing processes, and driving efficiency, making it highly valuable in both government and private IT sectors.
AI-302T.2-PSO1	3	Understanding production systems and search algorithms enables IT solutions by automating decisions and optimizing problem-solving. Utilizing AI, machine learning, and data analytics, these technologies improve efficiency, accuracy, and personalization, enhancing user experiences in line with current trends and practices

AI-302T.2-PSO2	2	Understanding production systems and search algorithms is essential for roles like researcher, developer, analyst, tester, and administrator in both government and private IT sectors. It enables individuals to automate decision-making, optimize problem-solving, and develop innovative solutions, aligning with the evolving needs of the industry.
AI-302T.3-PSO1	3	Applying diverse algorithms and techniques in IT solutions enables the analysis of results, fostering innovation and optimization in line with current trends and technologies. This approach enhances user experiences by leveraging AI, machine learning, and data analytics to drive efficiency and effectiveness across various domains.
AI-302T.3-PSO2	2	Applying various algorithms and techniques in IT solutions enables thorough result analysis, essential for roles like researcher, developer, analyst, tester, and administrator in both government and private sectors. This skill set facilitates problem-solving, innovation, and optimization, enhancing efficiency and effectiveness across diverse domains.
AI-302T.4-PSO1	3	Studying expert systems and modern approaches enables the creation of real-time applications in Information Technology solutions. By incorporating current trends like AI, machine learning, and big data analytics, along with advanced technologies and best practices, these systems deliver efficient, personalized, and responsive user experiences across various domains.
AI-302T.4-PSO2	2	Studying expert systems and modern approaches equips individuals for IT positions across government and private sectors by enabling the creation of real-time applications. This knowledge, coupled with expertise in AI, machine learning, and big data analytics, facilitates innovation, efficiency, and personalized user experiences, aligning with industry demands and trends.

Department of Information Technology

3.1.1 Course Name: SSMD **Course Code: DA-304 T**

At the end of the course, student will be able to

Co.'s		Bloom's Level
Co-1	To remember and understand the basic concepts and statistics visualization and probability, statistical modeling	Remember, Understand
Co-2	To apply regression analysis and interpret the results. Be able to fit a model to data and evaluate the adequacy of the model	Apply, Evaluate
Co-3	To understand and analyse classes of open and closed sets of R, concept of compactness and describe metric space in R_n	Understand, Analyze
Co-4	To implement the advance concept of data analytics and linear algebra	Create

COs-POs mapping.

Course outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
Course Code:- **DA-304T**														
CO.1	**3**	**3**	**3**	**3**	**3**	**--**	**--**	**1**	**2**	**--**	**--**	**3**	**2**	**2**
CO.2	**3**	**3**	**3**	**3**	**3**	**--**	**--**	**1**	**2**	**--**	**--**	**3**	**2**	**--**
CO.3	**3**	**3**	**3**	**3**	**3**	**--**	**--**	**1**	**2**	**--**	**3**	**2**	**2**	**--**
CO.4	**3**	**3**	**3**	**3**	**3**	**--**	**--**	**1**	**2**	**--**	**--**	**3**	**2**	**2**

Mapping	**LOW/ MEDIUM/ HIGH**	**Justification**
DA-304T.1-PO1	HIGH	To understand and apply the patterns or trends in descriptive data sets using statistical measures as mean, median and mode value is used to observe the direction in which information leans and to draw inferences from data the variance, and standard deviation is used.
DA-304T.1-PO2	MEDIUM	To analyze complex data and to identify patterns by extracting valuable insights using Data Visualization techniques
DA-304T.1-PO3	MEDIUM	To develop solutions for complex problems the Probability distributions are used to measure and predict probabilities to estimate the likelihood of achieving certain outcomes. They are also used to determine confidence intervals around estimated values. Introduction to Probability Distributions
DA-304T.1-PO4	HIGH	The research methods Hypothesis testing is used to test theories and assumptions before putting it into action that essentially allows to verify its analysis to implement a broad strategy.
DA-304T.1-PO5	MEDIUM	To apply Linear Algebra and Population Statistics methodologies to organize data by focusing on the vectors , vector spaces and linear transformations.
DA-304T.1-PO5	MEDIUM	To apply Mathematical Methods and Probability Theory to implicate data analytical interpretation by designing experiments using research methods.

DA-304T.1.PO11	LOW	Sampling Distributions and Statistical Inference is used to demonstrate the variability while conducting research over statistical data considering various effecting variables.
DA-304T.1.PO8	LOW	The Quantitative analysis is the process of collecting and evaluating measurable and verifiable data to understand the behavior and performance of a stated problems.
DA-304T.1.PO9	MEDIUM	Linear models, analysis of variance, applications in various fields will improves personal analytical skills and enhance the ability to work effectively in team settings by communicate data-driven insights, and lead diverse teams towards achieving shared objectives in multidisciplinary environments.
DA-304T.1.PO10	MEDIUM	The clear communication of statistical analyses and results builds transparency and trust with stakeholders, including the general public, clients, and regulatory bodies.
DA-304T.1.PO11	MEDIUM	The regression analysis enhance ability to apply engineering and management principles in project settings to gain the skills needed to analyze data, forecast outcomes, manage risks, and make informed decisions, thereby the Gauss-Markov theorem and geometry of least squares, improves the effectiveness as project managers and leaders in multidisciplinary environments.
DA-304T.1.PO12	HIGH	Statistics build a strong foundation in statistics but also develop the skills and mindset necessary for lifelong learning. This prepares to continuously adapt to thrive in the ever-evolving landscape of technological change.
DA-304T.2-PO1	MEDIUM	The subspace formulation of linear models is used to develop advanced skills in regression analysis and also to cultivate the ability and mindset necessary for lifelong learning. This prepares to continuously adapt to and thrive in the ever-evolving landscape of technological change.
DA-304T.2-PO2	HIGH	The subspace formulation of linear models individuals enhance ability to identify, formulate, and analyze engineering problems using robust statistical methods. By ensuring that engineers can draw reliable conclusions from data, contributing to effective problem-solving and decision-making in complex engineering contexts.
DA-304T.2-PO3	MEDIUM	The Orthogonal projections, regression models and factorial experiments is crucial for designing solutions to complex engineering problems and it allows for modeling prediction of system behaviors, ensuring that solutions meet specified needs.
DA-304T.2-PO4	MEDIUM	Analysis of covariance and model formulae provides the ability to evaluate model adequacy to ensure that conclusions are based on robust and reliable data analysis.
DA-304T.2-PO5	MEDIUM	Proficiency in regression diagnostics, transformations analysis involves modern statistical software and tools as R studio and SPSS for data modeling and prediction by understanding the application of these tools to ensure the appropriate application in engineering activities.
DA-304T.2-PO6	LOW	Regression analysis includes residuals and influence diagnostics to apply the impact of various factors on societal, health, safety, legal, and cultural issues. By applying reasoning and statistics for assessing and addressing issues
DA-304T.2.PO9	HIGH	The Box-Cox models is applied to assess the variability of data to find appropriate solutions quantitatively by catering to facilitating sustainable development.
DA-304T.2.PO10	MEDIUM	The model selection and model building strategies provides ability to interpret regression results to communicate complex data analyses clearly and effectively in reports, presentations, and documentation.
DA-304T.2.PO11	MEDIUM	The logistic regression models and Poisson regression models are essential for project planning and management, enabling accurate forecasting, resource allocation, and risk assessment.
DA-304T.2.PO12	HIGH	To develop a comprehensive skill set to enhance ability to analyze, design, manage, and communicate effectively, while also promoting ethical practices, teamwork, and lifelong learning.
DA-304T.3.PO1	HIGH	Insight knowledge of describing classes of open and closed set is highly required to apply in real-life engineering problems.

DA-304T.3.PO2	HIGH	The basic concept of compactness is very important to measure how closely the real numbers are clustered around zero. Whereas, the closer the number is to zero, the more compact it is
DA-304T.3.PO3	HIGH	Data analytics plays a key role in providing a deeper understanding of processes, behaviours, and trends. It allows organizations to gain insights into customer preferences, market dynamics, and operational efficiency
DA-304T.3.PO4	HIGH	To work in Software's like Tableau, Python, MATLAB, R, MySQL, SAS, Jupiter, etc.it is necessary to understand the terminologies and to apply it in real life engineering applications.
DA-304T.3.PO5	HIGH	Data analytics are useful in several different ways, such as for building a business strategy or ensuring the safety and efficiency of an engineering project.
DA-304T.3.PO8	LOW	The understanding of metric space in Rn is required to analyse the datasets and its applications which interpret a group (ensemble) of reservoir models and are attractive methods for uncertainty studies or sensitivity analysis when a (large) ensemble of reservoir models are used.
DA-304T.3.PO9	MEDIUM	Metric spaces are used in various applications, for example in internet search engines, image classification, or protein classification etc.
DA-304T.3.PO11	HIGH	In data analytics, Compactness and connectedness of clusters as *a measurement of stability* was considered and are effectively applied on complex engineering activities with the engineering community and with society at large.
DA-304T.3.PO12	MEDIUM	The knowledge of data analytics is important for finding the solution of complex engineering problems which are helpful in predicting modelling, machine learning algorithms, managing projects and in Multidisciplinary environments
DA-304T.3.PSO1	MEDIUM	The transform data analytic technique for solving real life applications helps to understand the latest technologies, software tools and their limitations for modelling in complex engineering activities.
DA-304T.4.PO1	HIGH	The understanding of advanced data analytics is necessary to solve the real life problems and *to forecast future outcomes and to guide their decision-making*,.
DA-304T.4.PO2	HIGH	The formulated complex real-life problems into vector spaces are used to represent and solve a wide variety of problems, from finding the best fit line for a set of data points to computing the forces acting on a rigid body
DA-304T.4.PO3	HIGH	The Comprehensive knowledge of subspaces has numerous applications in real life, especially in the field of engineering, physics, and computer science. It is a powerful tool that can be used to analyse the properties of spaces and their subsets.
DA-304T.4.PO4	HIGH	Various Eigenvalues are used to analyze the structure of graphs and networks. The adjacency matrix of a graph can be analyzed through its eigenvalues, providing insights into properties like connectivity, clustering, and centrality of nodes in the network which are used to conduct investigations of complex engineering problems.
DA-304T.4.PO5	HIGH	Data Analytics are used to analyse data related can help a bank to personalize customer interactions, a health care system to predict future health needs, or an entertainment company to create the next big streaming hit.
DA-304T.4.PO8	LOW	The knowledge of data analytics are adopted for examining raw data with the intention of identifying patterns and trends that can be used to produce useful information, draw conclusions and make informed decisions identifies the consequential responsibilities relevant to professional engineering practices.
DA-304T.4.PO9	MEDIUM	In advanced data analytics, the obtained numerical results are interpreted, analysed, and concluded in various research related problems.
DA-304T.4.PO12	HIGH	The Knowledge of obtained Advanced data analytics of Eigen values and Eigen vectors can be helpful in analyse the stability of dynamic systems, finding real-life solutions and Multidisciplinary environment.
DA-304T.4.PSO1	MEDIUM	Advanced data Analytics are very effective to work in multidisciplinary field of engineering and sciences as individual.
DA-304T.4.PSO2	MEDIUM	To work in Software's like Tableau, Python, MATLAB, R, MySQL, SAS, Jupiter, etc. uses data analytics to solve real life applications

Course Name: Artificial Intelligence and Machine Learning **Course Code:** AI – 316T

Course Outcomes (CO): At the end of the course, student will be able to:-

CO	Statement	Blooms Level
AI – 316T.1	Understand intelligent agents, search technique and apply various problem –solving strategies to common AI applications.	Understand, Apply
AI – 316T.2	Apply propositional logic and FOL in reasoning.	Apply
AI – 316T.3	Understand basic concept of machine learning, and analyse various machine learning techniques.	Understand, Remember, Analyse
AI – 316T.4	Develop an application that evaluate different types of supervised learning techniques.	Create , evaluate

Co-Po Mapping: Note: Enter correlation levels 1, 2 or 3 as defined below:

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

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

Mapping	LOW/MEDIUM/HIGH	Justification
AI-316T.1 -PO1	3	Understanding intelligent agents, search techniques, and problem-solving strategies is crucial for developing AI applications, which rely on engineering principles like mathematics, programming, and systems thinking.
AI-316T.1 -PO2	3	Understanding intelligent agents, search techniques, and problem-solving strategies is essential for analyzing and addressing complex problems in AI applications. These concepts enable engineers to break down and systematically approach AI challenges, ensuring thorough and effective solutions based on solid analytical principles.
AI-316T.1 -PO3	3	Understanding intelligent agents, search techniques, and problem-solving strategies ensures the development of robust, innovative AI applications that meet specific requirements and perform optimally.
AI-316T.1 –PO4	3	Understanding intelligent agents, search techniques, and problem-solving strategies ensures comprehensive investigations that lead to robust and innovative AI applications.
AI-316T.1-PO5	3	Understanding intelligent agents, search techniques, and problem-solving strategies ensures the proficient use of modern AI tools, leading to innovative and efficient solutions.
AI-316T.1-PO6	2	Understanding intelligent agents, search techniques, and problem-solving strategies ensures that AI solutions are socially responsible, ethical, and enhance the well-being of communities.
AI-316T.1-PO7	2	Understanding intelligent agents, search techniques, and problem-solving strategies enable engineers to create intelligent systems that optimize resource use, reduce waste, and address ecological challenges.
AI-316T.1-PO12	2	Understanding intelligent agents, search techniques, and problem-solving strategies equip engineers with the skills to continually adapt to new technologies, methodologies, and advancements in AI.

AI-316T.2 -PO1	3	Applying propositional logic and first-order logic (FOL) in reasoning enable engineers to formally represent and analyse complex systems, ensuring precise and accurate problem-solving.
AI-316T.2-PO2	3	Applying propositional logic and first-order logic (FOL) in reasoning enable engineers to systematically decompose complex problems, identify dependencies, and derive conclusions.
AI-316T.2 -PO3	3	Applying propositional logic and first-order logic (FOL) in reasoning enable engineers to formalize requirements, specify system behavior, and verify the correctness of designs.
AI-316T.2 –PO4	3	Applying propositional logic and first-order logic (FOL) in reasoning 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.
AI-316T.2-PO5	3	Applying propositional logic and first-order logic (FOL) in reasoning 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
AI-316T.2-PO6	2	Applying propositional logic and first-order logic (FOL) in reasoning ensures that engineering solutions are socially responsible, ethical, and contribute positively to society's well-being.
AI-316T.2-PO7	2	Applying propositional logic and first-order logic (FOL) in reasoning enable engineers to model and analyse environmental impacts, optimize resource use, and design systems that minimize ecological footprint.
AI-316T.2-PO12	2	Applying propositional logic and first-order logic (FOL) in reasoning supports ongoing professional growth, ensuring engineers can innovate and solve new challenges throughout their careers.
AI-316T.3 -PO1	3	Understanding machine learning basics along with regression, classification, 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.
AI-316T.3-PO2	3	Understanding the basic concepts of machine learning and reinforcement learning, and analyzing various ML techniques enable engineers to systematically decompose problems, select appropriate ML algorithms, and evaluate model performance to derive effective solutions.
AI-316T.3 -PO3	3	Understanding the basic concepts of machine learning and analyzing various ML techniques enable engineers to select and apply appropriate ML algorithms, optimize model parameters, and integrate ML solutions into robust engineering systems.
AI-316T.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.
AI-316T.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.
AI-316T.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.

AI-316T.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.
AI-316T.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.
AI-316T.4 -PO1	3	Developing an application to evaluate supervised learning techniques ensures effective model selection and performance optimization in engineering applications.
AI-316T.4-PO2	3	Developing a supervised learning evaluation application ensure robust performance and effective problem analysis in engineering applications.
AI-316T.4 -PO3	3	Developing a supervised learning evaluation application ensures robust solution development, optimization of model parameters, and effective performance evaluation in engineering applications.
AI-316T.4 –PO4	3	Developing a supervised learning evaluation application ensures effective problem analysis and solution development in engineering applications.
AI-316T.4-PO5	3	Developing a supervised learning evaluation application ensure robust evaluation, supporting comprehensive problem analysis and solution development in engineering applications.
AI-316T.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.
AI-316T.4-PO7	2	Developing a supervised learning evaluation application assess model performance using metrics (accuracy, RMSE) to ensure responsible deployment and positive impact on society, integrating feedback for continuous improvement in engineering applications.
AI-316T.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.
AI-316T.1-PSO1	2	Understanding intelligent agents and search techniques equips you to solve complex AI problems efficiently. Learning CS Engineering fundamentals and using the latest tools ensures effective real-time solutions to diverse engineering challenges.
AI-316T.1-PSO2	2	Understanding intelligent agents, search techniques, and problem-solving strategies is crucial for addressing complex engineering problems across diverse industries, supporting your capability to find effective solutions using advanced tools.
AI-316T.2-PSO1	2	Applying propositional logic and first-order logic (FOL) in reasoning 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.
AI-316T.2-PSO2	2	Applying propositional logic and first-order logic (FOL) in reasoning enhances your ability to analyze and develop efficient solutions, contributing to innovative practices in Healthcare, Process Industry, Power Sector, IT, and Management.
AI-316T.3-PSO1	2	Understanding and analyzing various machine learning techniques enhances the ability to learn basic concepts of CS 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 CS-related challenges, fostering proficiency in engineering applications.
AI-316T.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.

AI-316T.4-PSO1	2	Developing an application to evaluate different types of supervised learning techniques enables learning basic concepts of CS Engineering and the ability to apply effective real-time solutions to complex engineering problems using the latest tools.
AI-316T.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.

Department of Information Technology

3.1.1 Course Name: Network Security and Cryptography Course Code: (CS-312T)

At the end of the course, student will be able to

CO	Statement	Bloom Level(s)
CS-312T.1	Classify the symmetric encryption techniques and Illustrate various Public key cryptographic techniques	L1-Remember, L2-Understand
CS-312T.2	Understand security protocols for protecting data on networks and be able to digitally sign emails and files.	L1-Remember, L2-Understand, L3-Apply
CS-312T.3	Understand vulnerability assessments and the weakness of using passwords for authentication.	L4-Analyze, L5-Evaluate
CS-312T.4	Be able to perform simple vulnerability assessments and password audits, Summarize the intrusion detection and its solutions to overcome the attacks	L4-Analyze, L5-Evaluate, L6- Creating

3.1.2. CO-PO Mapping

Course Objectives :	
1.	To understand basics of Network Security and Cryptographic techniques.
2.	Identify the essential and up-to-date concepts, algorithms, protocols, tools, and methodology of Security
3.	To learn about how to maintain the Confidentiality, Integrity and Availability of a data.
4.	To understand various protocols for network security to protect against the threats in the networks.
Course Outcomes (CO)	
CO 1	Classify the symmetric encryption techniques and Illustrate various Public key cryptographic techniques.
CO 2	Understand security protocols for protecting data on networks and be able to digitally sign emails and files.
CO 3	Understand vulnerability assessments and the weakness of using passwords for authentication
CO 4	Be able to perform simple vulnerability assessments and password audits, Summarize the intrusion detection and its solutions to overcome the attacks.

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
CO 1	3	2	2	1	1	-	-	-	-	1	-	1
CO 2	3	3	2	2	1	-	-	-	-	1	-	2
CO 3	3	2	2	1	2	-	-	-	-	1	-	2
CO 4	2	2	1	2	2	-	-	-	-	1	-	1

CO	PSO1	PSO2
Classify the symmetric encryption techniques and illustrate various public key cryptographic techniques.	2	3
Understand security protocols for protecting data on networks and be able to digitally sign emails and files.	3	3
Understand vulnerability assessments and the weakness of using passwords for authentication	3	3
Be able to perform simple vulnerability assessments and password audits, Summarize the intrusion detection and its solutions to overcome the attacks.	3	3

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

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
CO1-PO1	H	Kowledge of symmetric and public key encryption techniques and concepts directly applies and combines extensive engineering knowledge to solve complex problems in the domain of network security.
CO1-PO2	M	Understanding symmetric and public key encryption techniques aids in identifying and analyzing complex engineering problems using foundational principles.
CO1-PO3	M	Understanding symmetric and public key encryption techniques contributes to designing effective solutions for problems related to Safety.
CO1-PO4	L	symmetric and public key encryption techniques is crucial for conducting thorough investigations, analyzing data, and synthesizing information to solve complex problems
CO1-PO5	L	symmetric and public key encryption techniques enable the effective use and application of modern engineering tools and techniques in complex engineering tasks
CO1-PO10	L	symmetric and public key encryption techniques enhance the ability to communicate complex engineering ideas effectively through reports, presentations, and clear instructions.
CO1-PO12	L	symmetric and public key encryption techniques cultivate the skills and mindset necessary for continuous, independent learning in response to evolving technological advancements
CO2-PO1	H	Knowledge of security protocols techniques and concepts directly applies and combines extensive engineering knowledge to solve complex problems in the domain of network security.
CO2-PO2	H	Understanding security protocols techniques aids in identifying and analyzing complex engineering problems using foundational principles.

CO2-PO3	M	Understanding security protocols techniques contributes to designing effective solutions for problems related to Safety.
CO2-PO4	M	security protocols techniques is crucial for conducting thorough investigations, analyzing data, and synthesizing information to solve complex problems
CO2-PO5	L	security protocols techniques enable the effective use and application of modern engineering tools and techniques in complex engineering tasks
CO2-PO10	L	security protocols techniques enhance the ability to communicate complex engineering ideas effectively through reports, presentations, and clear instructions.
CO2-PO12	H	security protocols techniques cultivate the skills and mindset necessary for continuous, independent learning in response to evolving technological advancements
CO3-PO1	H	Kowledge of vulnerability assessments techniques and concepts directly applies and combines extensive engineering knowledge to solve complex problems in the domain of network security.
CO3-PO2	M	Understanding vulnerability assessments techniques aids in identifying and analyzing complex engineering problems using foundational principles.
CO3-PO3	M	Understanding vulnerability assessments techniques contributes to designing effective solutions for problems related to Safety.
CO3-PO4	L	vulnerability assessments techniques is crucial for conducting thorough investigations, analyzing data, and synthesizing information to solve complex problems
CO3-PO5	M	vulnerability assessments techniques enable the effective use and application of modern engineering tools and techniques in complex engineering tasks
CO3-PO10	L	vulnerability assessments techniques enhance the ability to communicate complex engineering ideas effectively through reports, presentations, and clear instructions.
CO3-PO12	M	vulnerability assessments techniques cultivate the skills and mindset necessary for continuous, independent learning in response to evolving technological advancements
CO4-PO1	M	Kowledge of intrusion detection techniques and concepts directly applies and combines extensive engineering knowledge to solve complex problems in the domain of network security.
CO4-PO2	M	Understanding intrusion detection techniques aids in identifying and analyzing complex engineering problems using foundational principles.
CO4-PO3	L	Understanding intrusion detection techniques contributes to designing effective solutions for problems related to Safety.

CO4-PO4	M	intrusion detection techniques is crucial for conducting thorough investigations, analyzing data, and synthesizing information to solve complex problems
CO4-PO5	M	intrusion detection techniques enable the effective use and application of modern engineering tools and techniques in complex engineering tasks
CO4-PO10	L	intrusion detection techniques enhance the ability to communicate complex engineering ideas effectively through reports, presentations, and clear instructions.
CO4-PO12	L	intrusion detection techniques cultivate the skills and mindset necessary for continuous, independent learning in response to evolving technological advancements