22IES410 ELEMENTS OF DISCRETE STRUCTURES IV

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Explain the fundamental concepts of set theory and logic, relations and functions, number theory and counting techniques, algebraic structures, and graph theory for solving basic problems in discrete mathematics.	-
CO2	Interpret the principles of logical inference, equivalence relations, modular arithmetic, group properties, and graph models with real world problems by oral questions.	PO1, PO2, PO4
CO3	Apply concepts of relations, functions, counting techniques, recurrence relations, algebraic structures, and graph algorithms to solve standard discrete mathematics problems such as equivalence relations, invertible functions, linear recurrence relations, homomorphisms and graph coloring by conducting online quiz.	PO1, PO2, PO3,PO5, PO8
CO4	Analyze mathematical structures such as partial orders, lattices, groups, rings, and graphs to determine their properties and interrelationships using assignments.	PO1, PO2, PO4,PO5, PO8
CO5	Evaluate and justify solutions involving logical proofs, congruences, algebraic homomorphisms, and graph properties using appropriate mathematical reasoning by conducting online interactive test.	PO1, PO2, PO4,PO5, PO8
CO6	Construct and design mathematical models, proofs, and problem-solving strategies using combinatorics, algebraic structures, recursive functions, and graph theory by presenting report.	PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO10, PO11

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	–	–	–	–	–	–	–	–	–	–	–	–	–
CO2	2	3	–	2	–	–	–	–	–	–	–	2	1
CO3	3	2	2	–	2	–	–	2	–	–	–	2	1
CO4	2	3	–	2	2	–	–	2	–	–	–	2	1
CO5	2	3	–	2	2	–	–	2	–	–	–	2	1
CO6	3	3	3	2	2	–	–	3	2	1	2	2	1
22IES410	2	3	1	2	2	-	-	2	1	1	1	2	1

22IPC404 EMBEDDED SYSTEMS ARCHITECTURE IV

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Explain the fundamental concepts of embedded systems, embedded hardware and software, system-on-chip (SoC), classification of embedded systems, and the embedded system design process for real-time applications.	_
CO2	Interpret microcontroller architecture concepts such as 8051 architecture, memory organization, I/O interfacing techniques, timers, counters, interrupts, DMA, and communication mechanisms with real-world embedded system examples through oral questioning.	_
CO3	Apply programming concepts using assembly language, C, C++, and Java to develop embedded applications employing program models, data flow graphs, and state machine models by conducting online quizzes / coding exercises.	PO1,PO2,,PO4
CO4	Analyze inter-process communication mechanisms, process synchronization techniques, tasks, threads, and shared resources in embedded applications using semaphores, message queues, pipes, sockets, and RPC through assignments.	PO1,PO2
CO5	Evaluate and justify the design and performance of real-time operating systems (RTOS), including task scheduling models, interrupt latency, response time, memory management, and OS security issues by conducting online interactive tests.	PO1,PO2,PO4,PO9
CO6	Construct and design embedded system solutions using RTOS concepts, multiprocessor system modeling, UML modeling, and real-time constraints to solve practical problems by preparing and presenting a technical report.	PO1,PO2

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO 1	–	–	–	–	–	–	–	–	–	–	–	–	–
CO2	–	–	–	–	–	–	–	–	–	–	–	–	–
CO3	2	3	–	2	–	–	–	–	–	–	–	2	–
CO4	2	2	–	–	–	–	–	–	–	–	–	3	–
CO5	2	2	–	2	–	–	–	–	1	–	–	3	–
CO6	1	2	–	–	–	–	–	–	–	–	–	1	–
22IPC404	2	2	-	1	-	-	-	-	1	-	-	2	-

22IPC405 DATABASE SYSTEMS IV

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Explain fundamental database concepts, architectures, and SQL/NoSQL data models with their design strategies and constraints.	-
CO2	Design normalized database schemas using ER and relational modeling by analyzing functional dependencies relevant to application domains through schema design projects and normalization lab reports.	PO1, PO2, PO3
CO3	Develop and optimize complex SQL queries and apply PL/SQL principles to design triggers and views using SQL Server, through query tuning assignments.	PO3, PO4, PO5
CO4	Evaluate storage architectures and indexing structures by investigating performance trade-offs using tools like Oracle Database, SQL Server, and Docker containers, ensuring cost-effective physical database design through indexing strategy reports and storage analysis projects.	PO4, PO5, PO10
CO5	Implement transaction management and concurrency control using MySQL and pgAdmin, ensuring reliability while considering environmental, societaland project management aspects through simulation exercises.	PO7, PO9, PO10
CO6	Analyze NoSQL data models and polyglot persistence strategies to evaluate ethical data handling and societal impact through recent case studies and present ethical debates on data models.	PO6, PO8, PO11

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	2	-
CO3	-	-	3	3	3	-	-	-	-	-	-	2	-
CO4	-	-	-	3	3	-	-	-	-	3	-	2	1
CO5	-	-	-	-	-	-	2	2	2	-	-	1	2
CO6	-	-	-	-	-	2	-	2	-	-	2	-	2
22IPC405	1	1	2	2	2	1	1	2	1	1	1	2	1

22IES411 PRINCIPLES OF COMMUNICATION ENGINEERING IV

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Explain the fundamental principles of analog, digital, pulse, and data communication systems, including modulation, coding, noise effects, and multi-user communication concepts.	-
CO2	Apply principles of analog and digital modulation, pulse and data communication techniques, coding methods, and multiple access schemes to analyze communication systems.	**PO1, PO2, PO3**
CO3	Analyze communication systems using signal representation, bandwidth efficiency, noise performance, channel capacity, coding efficiency, and multi-user communication techniques.	**PO1, PO2, PO4**
CO4	Design basic communication system models by selecting appropriate modulation techniques, coding schemes, data transmission methods, and multiple access strategies.	**PO1, PO2, PO3**
CO5	Evaluate the role and performance of communication engineering principles in modern systems such as cellular, satellite, wireless data, and short-range communication technologies.	**PO1, PO2, PO6, PO11**
CO6	Seminar to be presented on advanced and emerging topics in communication engineering by integrating concepts of analog, digital, pulse and data communication, coding techniques, and multi-user radio communication, extending beyond the prescribed syllabus.	**PO4, PO8, PO9, PO11**

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	1
CO2	3	3	2	-	-	-	-	-	-	-	1	2	1
CO3	2	3	-	2	-	-	-	-	-	-	1	1	2
CO4	2	2	3	-	-	-	-	-	-	-	1	2	1
CO5	2	2	-	-	-	2	-	-	-	-	2	1	2
CO6	-	-	-	2	-	-	-	3	3	-	3	1	2
22IES411	2.3	2.5	2.5	2	-	2	-	3	3	-	1.6	1.4	1.5

22IPC406 DESIGN AND ANALYSIS ALGORITHMS IV

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Recall fundamental concepts of asymptotic notations, efficiency classes, algorithm design paradigms such as decrease and conquer, greedy, divide and conquer and dynamic programming etc	--
CO2	Explain the mathematical analysis of recursive and non-recursive algorithms and algorithmic design techniques such as decrease-and-conquer, greedy methods, divide-and-conquer, and dynamic programming etc	PO1, PO2
CO3	Apply suitable algorithm design techniques and mathematical analysis methods to solve computational problems and compute their time complexities through team based problem-solving assignments and Online tools such as TimeComplexity.ai etc	PO1, PO2, PO3, PO5, PO9
CO4	Analyze and compare algorithm performance using asymptotic notations and mathematical analysis for recursive and non-recursive algorithms across different paradigms through case studies, worksheets and internal assessments.	PO1, PO2, PO3, PO4
CO5	Evaluate and justify appropriate algorithmic strategies for the given problem by comparing efficiency classes and design techniques through group project presentations and case study analysis.	PO1, PO2, PO3, PO4, PO10
CO6	Design and present a suitable algorithmic solution for a real-world problem using appropriate paradigms and complexity analysis through open-ended team projects involving modern programming tools such as python, project planning, documentation, and formal technical presentations	PO1, PO2, PO3, PO4, PO5, PO9, PO10, PO11

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	-	-	-	-	-	-	2	-
CO3	3	3	3	-	2	-	-	-	1	-	-	3	2
CO4	3	3	2	3	-	-	-	-	-	-	-	2	1
CO5	3	3	3	2	-	-	-	-	-	1	-	3	2
CO6	3	3	3	3	2	-	-	-	2	1	1	3	3
22IPC406	3	3	3	2	1	-	-	-	1	1	1	3	2

22IES412 FOUNDATIONS OF DATA SCIENCE IV

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Explain the fundamental concepts and lifecycle of data science, including its importance in solving real-world problems	-
CO2	Apply statistical foundations and mathematical principles to analyze and interpret complex datasets.	PO1, PO2
CO3	Perform data pre-processing and exploratory data analysis using modern tools to clean and visualize data for insights.	PO1, PO2, PO3, PO5
CO4	Implement various machine learning algorithms for classification and regression tasks to build predictive models.	PO1, PO2, PO3, PO4, PO5
CO5	Analyze the degree of certainty and evaluate model performance using statistical tests and validation metrics.	PO2, PO4
CO6	Communicate data-driven findings and professional insights effectively through reports and presentations.	PO9

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	–	–	–	–	–	–	–	–	–	–	–	–	–
CO2	3	2	–	–	–	–	–	–	–	–	–	2	1
CO3	3	3	2		3	–	–	–	–	–	–	2	1
CO4	3	2	3	2	3	–	–	–	–	–	–	2	1
CO5	–	2	–	2	–	–	–	–	–	–	–	2	1
CO6	–	–	–	–	–	–	–	–	3	–	–	2	1
22IES412	2	2	1	1	1	–	–	–	1	–	–	2	1

22IPC407 DATABASE SYSTEMS LABORATORY IV

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Execute DDL, DML, DCL and TCL commands along with built-in functions and relational algebra operations in MySQL to demonstrate fundamental database operations through hands-on lab exercises.	-
CO2	Implement materialized views, stored procedures, functions, triggers and cursors in PL/SQL to automate database operations and ensure data integrity through coding assignments and debugging sessions.	**PO1, PO2, PO3**
CO3	Create, query and manage NoSQL databases using appropriate NoSQL commands, indexing, and cursor implementations to handle unstructured data through NoSQL lab exercises and performance analysis.	**PO3, PO4, PO5**
CO4	Compare and evaluate cloud and distributed database systems (MySQL on VM, CockroachDB, YugabyteDB, Snowflake) through setup, configuration and benchmarking exercises to assess scalability and deployment strategies	**PO4, PO5, PO10**
CO5	Develop functional database applications for domains such as banking, college management, inventory, and payroll by integrating transaction management, concurrency and security features through end-to-end project development.	**PO5, PO7, PO9, PO11**
CO6	Design and implement a mini-project using MySQL/NoSQL that incorporates ethical data handling, societal relevance, and sustainable design through documentation, presentation, and peer evaluation.	**PO6, PO8, PO11**

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	2	2
CO3	-	-	2	3	2	-	-	-	-	-	-	2	2
CO4	-	-	3	2	3	-	-	-	-	-	-	2	2
CO5	-	-	-	-	2	-	2	-	3	2	-	2	2
CO6	-	-	-	-	-	3	-	3	-	-	3	1	2
22IPC407	1	1	2	2	2	1	1	1	1	1	1	2	2

22IPC408 EMBEDDED SYSTEMS LABORATORY IV

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Explain the architecture and programming concepts of embedded processors and development boards.	-
CO2	Apply embedded C programming techniques to develop firmware for microcontroller-based systems like Microcontroller development boards , Aurdino Uno etc and programming and debugging tools like Keil etc assessed through laboratory exercises	PO1,PO2,PO5,PO9,PO10,PO11
CO3	Interface and control basic peripherals such as LEDs, switches, LCDs, sensors, and actuators evaluated through hands-on laboratory experiments	PO1,PO2,PO3,PO4,
CO4	Analyze timing constraints, interrupts, and communication protocols in embedded applications and evaluated through hands-on laboratory experiments	PO1,PO2,PO3,PO5, PO9, PO10,PO11
CO5	Design and implement simple embedded system solutions for a safe device operation and user responsibility and evaluated through case study analysis	PO1, PO2,PO3,PO4,PO5,PO6 ,PO9,PO11
CO6	Demonstrate simple real-time energy-efficient and environmentally responsible embedded system applications individually or in teams as mini project	PO1,PO2,PO3,PO4,PO5 , PO7,PO8 PO9,PO11

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	–	–	-	–	–	-	–	–	–	-	-
CO2	3	3	-	-	2	-	-	-	2	2	1	1	1
CO3	2	2	2	2	-	-	-	-	-	-	-	1	1
CO4	2	2	2	-	2	-	-	-	2	2	2	1	1
CO5	2	2	2	2	2	2	-	-	2	-	2	1	1
CO6	2	2	2	2	2	-	2	2	2	-	2	1	1
22IPC408	2	2	2	1	2	1	1	1	2	1	2	1	1

22IPC617 SOFTWARE ENGINEERING VI

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Explain software processes, agile methodologies and requirements engineering through use case development and requirements validation.	-
CO2	Design software models using scenario-based, data, class-based and behavioral modeling techniques through UML diagrams and pattern-based design projects.	PO1, PO2, PO3
CO3	Apply white-box, black-box and system testing strategies to debug and test OO/web applications, while estimating and scheduling software projects through risk management plans.	PO3, PO4, PO5
CO4	Implement Test-Driven Development (TDD) using test doubles and mocking, while applying refactoring and comparing TDD vs BDD through hands-on coding labs and refactoring exercises.	PO4, PO5, PO10
CO5	Evaluate CI/CD pipelines using tools like Jenkins, PhantomJS, and test frameworks (TestNG, Mockito) to ensure software quality and security through performance and security testing projects.	PO5, PO7, PO9, PO11
CO6	Analyze real-world case studies using Cucumber/Gherkin and mocking frameworks to create end-to-end test suites, while assessing ethical and societal impacts of testing strategies through case study presentations.	PO6, PO8, PO11

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	2	2
CO3	-	-	2	3	2	-	-	-	-	-	-	2	2
CO4	-	-	3	2	3	-	-	-	-	-	-	2	2
CO5	-	-	-	-	2	-	-	-	-	-	-	2	2
CO6	-	-	-	-		-	-	-	-	-	-	1	2
22IPC617	1	1	2	2	2	1	1	1	1	1	1	2	2

22IPC618 MACHINE LEARNING VI

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Explain the fundamental concepts of machine learning, learning paradigms, the design of learning systems, and key issues involved in machine learning algorithms through lectures, concept maps, quizzes, and short descriptive assessments.	-
CO2	Apply supervised learning techniques such as regression, classification, decision trees, ensemble learning, and support vector machines to solve real-world problems through problem-solving assignments, case studies.	PO1,PO2,PO4
CO3	Analyze dimensionality reduction and unsupervised learning techniques, including clustering and mixture models, for data analysis and pattern discovery through data-driven experiments, comparative studies, and analytical reports.	PO1,PO2,PO4
CO4	Analyze probabilistic learning models and graphical models such as Bayesian networks, Hidden Markov Models, and expectation–maximization algorithms through numerical problem analysis, algorithm walkthroughs, and model interpretation exercises.	PO1,PO2,PO4
CO5	Apply reinforcement learning techniques such as Q-learning, policy iteration, and temporal difference learning to solve sequential decision-making problems through simulation-based assignments, algorithm implementation tasks, and performance evaluation exercises	PO1,PO2,PO4
CO6	Examine and evaluate recent trends and real-world applications of machine learning by implementing and comparing models using R, Scikit-learn, Octave, BigML, and WEKA, and assessing their performance through tool-based experiments, comparative analysis reports, and technical presentations.	PO1,PO2,PO5

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	–	–	–	–	–	–	–	–	–	–	–	–	–
CO2	3	3	–	2	–	–	–	–	–	–	–	3	–
CO3	2	3	–	2	–	–	–	–	–	–	–	2	–
CO4	2	3	–	2	–	–	–	–	–	–	–	2	–
CO5	2	2	–	2	–	–	–	–	–	–	–	3	–
CO6	1	2	–	3	–	–	–	–	–	–	–	1	–
22IPC618	2	2	-	2	–	–	–	–	–	–	–	2	-

22IPC619 BIG DATA ANALYTICS VI

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Analyze the characteristics, challenges, data architectures, and application domains of Big Data systems to evaluate suitable analytics approaches for real-world data-intensive problems	PO1, PO2, PO4
CO2	Apply Hadoop ecosystem components such as HDFS, YARN, and MapReduce to store and process large-scale structured and semi-structured data efficiently.	PO1, PO2, PO5
CO3	Analyze large datasets using MapReduce programming, Hive, and Pig to extract meaningful insights from distributed data environments.	PO2, PO4, PO5
CO4	Implement scalable data analytics solutions using Apache Spark, including RDD-based processing, ETL pipelines, and analytics workflows.	PO3, PO4, PO5
CO5	Evaluate real-time and graph-based analytics solutions using Spark Streaming and GraphX for complex data-intensive applications.	PO3, PO4, PO5, PO9
CO6	Design and present a team-based Big Data analytics solution by applying modern tools, project planning principles, and self-directed learning.	PO3, PO9, PO11

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	3	–	2	–	–	–	–	–	–	–	1	2
CO2	2	2	–	–	3	–	–	–	–	–	–	3	2
CO3	–	3	–	3	2	–	–	–	–	–	–	3	2
CO4	–	–	3	2	3	–	–	–	–	–	–	3	3
CO5	–	–	2	3	2	–	–	–	2	–	–	2	3
CO6	–	–	2	–	–	–	–	–	3	–	3	2	3
22IPC619	1	2	2	2	2	-	-	-	1	-	1	3	3

22IPC620 WEB ESSENTIALS VI

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Recall the fundamental concepts of internet architecture, web protocols, HTML, CSS, JavaScript, server-side programming, and database connectivity.	
CO2	Discuss the working principles of websites, web designing techniques, client-side scripting, server-side programming, and database connectivity mechanisms.	PO1
CO3	Apply HTML, CSS, JavaScript, server-side programming, and database connectivity concepts to develop basic web applications.	PO3, PO5
CO4	Analyze client–server interactions, web application workflows, and database operations to identify design issues and improve application performance.	PO2, PO4, PO5
CO5	Evaluate web applications based on usability, performance, security, and data handling aspects using appropriate web development tools.	PO3, PO5, PO8
CO6	Design and develop a complete data-driven web application by integrating front-end design, client-side scripting, server-side programming, and database connectivity.	PO3, PO5, PO9, PO10, PO11

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	3	2
CO2	3	-	-	-	-	-	-	-	-	-	-	3	2
CO3	-	-	3		3	-	-	-	-	-	-	3	3
CO4	-	3		2	3	-	-	-	-	-	-	2	3
CO5	-	-	3		3	-	-	2	-	-	-	2	3
CO6	-	-	3		3	-	-	-	3	3	3	2	3
22IPC620	1	1	2	1	2	-	-	1	1	1	1	3	3

22IPE611 UI AND UX DESIGN VI

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Explain the fundamentals of UI/UX design, Human–Computer Interaction (HCI), interaction design principles, and usability concepts	-
CO2	Conduct user-centred research methods to identify user needs and translate insights into design requirements.	PO1,PO2,PO5,PO9,PO10,PO11
CO3	Analyze usability, accessibility, and interaction issues using UX laws, heuristics, and evaluation techniques.	PO1,PO2,PO3,PO4,
CO4	Create wireframes, prototypes, and responsive interfaces for web and mobile platforms using appropriate tools like Whimsical, FIGMA , ADOBE XD, Sketch ,Invision etc and demonstrated through seminar presentations.	PO1,PO2,PO3,PO5, PO9, PO10,PO11
CO5	Develop responsive and accessible user interfaces by applying design standards and assessed through assignments	PO1, PO2,PO3,PO4,PO5,PO9,PO11
CO6	Evaluate and refine UI/UX designs through user testing, heuristic evaluation, and collaborative design practices.	PO1,PO2,PO3,PO4,PO5,PO9,PO11

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	–	–	-	–	–	-	–	–	–	-	-
CO2	3	3	-	-	2	-	-	-	2	2	1	1	1
CO3	2	2	2	2	-	-	-	-	-	-	-	1	1
CO4	2	2	2	-	2	-	-	-	2	2	2	1	1
CO5	2	2	2	2	2	-	-	-	2	-	2	1	1
CO6	2	2	2	2	2	-	-	-	2	-	2	1	1
22IPE611	2	2	2	1	2	-	-	-	2	1	2	1	1

22IPE613 WEB APPLICATION SECURITY VI

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Explain the architecture of modern web applications and identify common web application security threats	-
CO2	Classify, prioritize, and assess web application threats by analyzing attack surfaces and applying threat modeling techniques using tools such as OWASP Threat Dragon, Microsoft Threat Modeling Tool, OWASP Top-10 framework, and CVE/CVSS databases with ethical responsibility.	PO1, PO2, PO4,PO5, PO8
CO3	Apply web security principles to implement secure authentication, authorization, and session management mechanisms by designing security solutions using OAuth 2.0, OpenID Connect, JSON Web Tokens (JWT), bcrypt/PBKDF2 password hashing libraries, IAM frameworks, and secure web frameworks, demonstrating with ethical practices.	PO1, PO2, PO3,PO5, PO8
CO4	Analyze browser security mechanisms and detect client-side vulnerabilities through systematic security testing using Burp Suite, OWASP ZAP, browser developer tools, CSP evaluators, and JavaScript security analyzers, demonstrating investigative ability with ethical awareness.	PO1, PO2, PO4,PO5, PO8
CO5	Evaluate and mitigate database and file-related security vulnerabilities by applying secure coding and access control techniques using SQLMap, secure ORM frameworks, database security scanners, static application security testing (SAST) tools, and secure file-handling mechanisms, reflecting engineering knowledge with ethical responsibility.	PO1, PO2, PO4,PO5, PO8
CO6	Design and deploy secure web applications by applying secure coding practices, vulnerability management techniques, and industry standards using OWASP ASVS, SAST/DAST tools, dependency vulnerability scanners (OWASP Dependency-Check, Snyk), DevSecOps CI/CD pipelines, container security tools, and compliance frameworks such as OWASP Top-10 and PCI DSS, addressing societal needs, sustainability considerations, ethical responsibility, teamwork, effective communication, and project management constraints using appropriate engineering solutions.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	–	–	-	–	–	-	–	–	–	-	-
CO2	2	3	–	2	1	–	–	2	–	–	–	2	1
CO3	3	2	2	–	2	–	–	2	–	–	–	2	1
CO4	2	3	–	2	2	–	–	2	–	–	–	2	1
CO5	2	3	–	2	2	–	–	2	–	–	–	2	1
CO6	3	3	3	2	3	1	1	3	2	1	2	2	1
22IPE613	2	3	2	2	2	1	1	2	2	1	2	2	1

22IPC621 BIG DATA ANALYTICS LABORATORY VI

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Explain the working principles of Hive tables, data types, HQL queries, Spark transformations and actions, streaming concepts, and integration with HDFS and external data sources.	-
CO2	Apply Hive, Spark RDDs, DataFrames, and Structured Streaming to ingest data, perform transformations, execute queries, and process batch and streaming data effectively by hands-on laboratory work.	PO1, PO2, PO3, PO4
CO3	Analyze job execution, query plans, Spark UI metrics, partitions, joins, aggregations, and performance bottlenecks to improve efficiency and scalability by hands-on laboratory work.	PO1,PO2, PO3, PO4, PO5
CO4	Evaluate optimization techniques, tuning parameters, distributed cache usage, UDAFs, and integration strategies to enhance performance and reliability of big data applications by conducting online interactive tests.	PO1,PO2, PO4,PO5, PO9, PO10, PO11
CO5	Design and develop end-to-end big data solutions, reusable Spark frameworks, automated workflows, and SDLC-based Spark projects for real-world analytics use cases by presenting miniprojects.	PO1,PO2, PO3, PO4,PO5, PO8, PO9, PO10, PO11
CO6	Create application by integrating data lakes, Hadoop and Hive, Spark RDDs, DataFrames, and Structured Streaming, applying performance optimization and tuning techniques, and implementing a modular, reusable framework following the Software Development Life Cycle (SDLC) using group projects.	PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO10, PO11

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	–	–	–	–	–	–	–	–	–	–	–	–	–
CO2	2	3	3	2	–	–	–	–	–	–	–	2	1
CO3	2	2	2	3	2	–	–	–	–	–	–	2	1
CO4	2	3	–	2	2	–	–	–	2	3	3	2	1
CO5	2	3	3	2	2	–	–	2	2	2	2	2	1
CO6	3	3	3	2	2	–	–	3	2	2	2	2	1
22IPC621	2	3	2	2	2	-	-	1	2	2	2	2	1

22IPC622 WEB ESSENTIALS LABORATORY VI

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Recall the fundamental concepts of interactive web design, client-side scripting, server-side programming, session management, database connectivity, and asynchronous web technologies.	
CO2	Discuss the working principles of interactive websites, JavaScript-based form validation, server-side web applications, session and cookie management, database connectivity, AJAX, and XML-based data retrieval.	PO1
CO3	Apply HTML, CSS, JavaScript, PHP, Servlets, and database connectivity techniques to implement interactive and data-driven web applications.	PO3, PO5
CO4	Analyze client–server interactions, session and cookie mechanisms, AJAX workflows, and database operations to identify errors and improve web application functionality.	PO2, PO4, PO5
CO5	Evaluate web applications based on usability, performance, security, and data handling aspects using appropriate web development tools.	PO3, PO5, PO8
CO6	Design and develop complete web applications such as online quiz and shopping systems by integrating front-end design, client-side scripting, server-side programming, session management, and database connectivity.	PO3, PO5, PO9, PO10, PO11,

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	3	2
CO2	3	-	-	-	-	-	-	-	-	-	-	3	2
CO3	2	-	3	-	3	-	-	-	-	-	-	3	3
CO4	-	3	-	2	3	-	-	-	-	-	-	2	3
CO5	-	-	3	-	3	-	-	2	-	-	-	2	3
CO6	-	-	3	-	3	-	-		3	3	3	2	3
22IPC622	1	1	2	1	2	-	-	1	1	1	1	3	3

22IES613 DESIGN THINKING FOR INFORMATION TECHNOLOGY IV

COURSE OUTCOMES

The Course Outcome(CO)		PO's Mapped
At the end of the course, the students will have the ability to		
CO1	Explain the principles, stages, and mindset of design thinking and its relevance to problem-solving in information technology.	-
CO2	Apply empathy-based user research techniques to identify user needs and define problem statements.	PO1,PO2, PO3,PO4
CO3	Analyze real-world societal and environmental problems using ideation tools such as Whimsical, Figjam etc and creative thinking techniques to generate innovative IT solutions assessed through group activities	PO1,PO2,PO3,PO4,PO5 , PO9,PO10
CO4	Design and develop low-fidelity prototypes for IT-based solutions considering ethical, cultural, and sustainability constraints assessed through sketch reviews	PO1,PO2,PO3,PO4,PO5 , PO6, PO7,PO8,PO9, PO10,PO11
CO5	Design and develop high-fidelity prototypes for IT-based solutions addressing usability, feasibility, and sustainability constraints assessed through seminar presentations.	PO1, PO2,PO3,PO4,PO5,PO6 ,PO7,PO8,PO9,PO10,P O11
CO6	Evaluate proposed solutions through testing, feedback, and iteration to improve usability and feasibility ensuring ethical responsibility and societal relevance through viva voce..	PO1,PO2,PO3,PO4,PO5 , PO6,PO7,PO8 PO9,PO10,PO11

MAPPING

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	_	_	_	_	_	_	_	-	-
CO2	2	2	2	2	_	_	_	_	_	_	_	1	1
CO3	2	2	2	2	2	_	_	_	2	2	_	1	1
CO4	2	2	2	2	2	2	2	2	2	2	2	1	1
CO5	2	2	2	2	2	2	2	2	2	2	2	1	1
CO6	2	2	2	2	2	2	2	2	2	2	2	1	1
22IES613	2	2	2	2	2	1	1	1	2	2	1	1	1