Institute/Department	UNIVERSITY INSTITUTE OF ENGINEERING (UIE)	**Program**	**Bachelor of Engineering (Artificial Intelligence and Data Science) (AI201)**
Master Subject Coordinator Name:	Prince Pal Singh	**Master Subject Coordinator E-Code**:	**E18505**
Course Name	Full Stack-II	**Course Code**	**23CSH-382**

Lecture	Tutorial	Practical	Self Study	Skilling	TC	TGT	TGP	Studio	Credit	Subject Type
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Course Type	Course Category	Mode of Assessment	Mode of Delivery
Major Core	Graded (GR)	Hybrid	Hybrid (HYB)

Mission of the Department	M1: To provide relevant, rigorous and contemporary curriculum and aligned assessment system to ensure effective learning outcomes for engineering technologies. M2: To provide platform for industry engagement aimed at providing hands-on training on advanced technological and business skills to our students. M3: To provide opportunities for collaborative, interdisciplinary and cutting-edge research aimed at developing solutions to real life problems. M4: To imbibe quest for innovation, continuous learning and zeal to pursue excellence through hard work and problem-solving approach. M5: To foster skills of leadership, management, communication, team spirit and strong professional ethics in all academic and societal endeavours of our students.
Vision of the Department	To be recognized as a centre of excellence for Computer Science & Engineering education and research, through effective teaching practices, hands-on training on cutting edge computing technologies and excellence in innovation, for creating globally aware competent professionals with strong work ethics whom would be proficient in implementing modern technology solutions and shall have entrepreneurial zeal to solve problems of organizations and society at large.

Program Educational Objectives(PEOs)	
PEO1	To be able to explore areas of research, technology application & innovation and make a positive impact in different types of institutional settings such as corporate entities, government bodies, NGOs, inter-government organizations, & start-ups.
PEO2	To be able to design, and implement technology and computing solutions to organizational problems, effectively deploy knowledge of engineering principles, demonstrate critical thinking skills & make the intellectual connections between quantitative and qualitative tools, theories, and context to solve the organizational problems
PEO3	To be able to work with, lead & engage big and small teams comprising diverse people in terms of gender, nationality, region, language, culture & beliefs. To understand stated and unstated differences of views, beliefs & customs in diverse & interdisciplinary team settings
PEO4	To be able to continuously learn and update one's knowledge, engage in lifelong learning habits and acquire latest knowledge to perform in current work settings
PEO5	To continuously strive for justice, ethics, equality, honesty, and integrity both in personal and professional pursuits. Able to understand and conduct in a way that is responsible and respectful.

Program Specific OutComes(PSOs)	
PSO1	PSO1: Graduates will be able to analyze, design, and develop intelligent systems and applications by applying core concepts of Artificial Intelligence and Machine Learning across diverse domains.
PSO2	PSO2: Graduates will demonstrate proficiency in utilizing advanced AI/ML tools, frameworks, and technologies to innovate, implement, and manage projects in the rapidly evolving field of Artificial Intelligence and its allied application areas.
PSO3	PSO3: Graduates will apply AI, Machine Learning, and Data Analytics techniques to address real-world challenges, delivering effective and ethical solutions for industry, research, and societal needs.

Program OutComes(POs)	
PO1	Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO2	Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3	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.
PO4	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.
PO5	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 limitationsPO4 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.
PO6	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
PO7	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO9	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	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.
PO11	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context to technological change.
PO13	Demonstrate the capability to apply analytic thought to a body of knowledge, including the analysis and evaluation of policies, and practices. Identify relevant assumptions or implications, logical flaws and loopholes in the presented arguments
PO14	Demonstrate to create, perform, or think in different and diverse ways about the given scenario. Innovate and perform tasks in a better manner, view a problem or a situation from multiple perspectives, think 'out of the box' and generate solutions to complex problems in unfamiliar contexts
PO15	Demonstrate the ability to identify with or understand the perspective, experiences, or points of view of another individual or group, and to identify and understand other people's emotions
PO16	Demonstrate the ability to participate in community-engaged services/ activities for promoting the well-being of society
PO17	Demonstrate the acquisition of knowledge of the values and beliefs of multiple cultures, capability to effectively engage in a multicultural group/society and interact respectfully with diverse groups and gender sensitivity and adopting a gender-neutral approach, as also empathy for the less advantaged and the differently-abled including those with learning disabilities.

Text Books

Sr No	Title of the Book	Author Name	Volume/Edition	Publish Hours	Years
1	Full-Stack Web Development with React and Node	David Choi	International Edition	Packt Publishing	2024
2	Learning Full-Stack JavaScript Development	Marten Deinum	Standard Edition	O'Reilly Media	2023
3	Spring Boot and Spring Cloud Microservices	Magnus Larsson	2nd Edition	Packt Publishing	2024

Reference Books

Sr No	Title of the Book	Author Name	Volume/Edition	Publish Hours	Years
1	Java Programming Language	James Gosling, Ken Arnold, David Holmes	5th Edition	Pearson Education	2024
2	Core Java — Volume I	Gary Cornell	3rd Edition	Pearson Education	2024

Course OutCome	
SrNo	OutCome
CO1	Students will be able to understand advanced front-end applications using modern state management, UI component libraries, and performance optimization techniques.
CO2	Students will be able to build and secure scalable back-end services using microservices architecture, serverless functions, real-time communication, and authentication mechanisms.
CO3	Students will be able to integrate and manage database operations effectively within full-stack applications, ensuring efficient data handling and security
CO4	Students will be able to implement testing, debugging, and state management solutions to deliver reliable and maintainable full-stack applications
CO5	Students will be able to deploy and scale full-stack applications using DevOps tools, containerization, CI/CD pipelines, and cloud platforms.

Lecture Plan Preview-Theory							
Unit No	LectureNo	ChapterName	Topic	Text/ Reference Books	Pedagogical Tool**	Mapped with CO Number(s)	BT Level
1	1	SPA & API Integration	Modern Front-End Architecture & SPA Concepts	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO1	BT2
1	2	UI Handling & Debugging	UI Component Libraries & Design Patterns	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO1	BT3

1	3	State Management	State Management (Redux / Context API)	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO1	BT3
1	4	UI Handling & Debugging	Performance Optimization Techniques	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO2	BT4
1	5	SPA & API Integration	Front-End Case Study & Analysis	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO1	BT4
2	6	Backend Architecture & MVC	Scalable Back-End Architecture & Microservices	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO2	BT2

2	7	Security & Authentication	Authentication & Authorization Mechanisms	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO2	BT3
2	8	RESTful APIs & Middleware	Real-Time Communication & Serverless Basics	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO2	BT3
2	9	RESTful APIs & Middleware	Database Integration & Secure Data Handling	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO3	BT3
2	10	Backend Architecture & MVC	Backend–Database Integration Case Study	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO2	BT4

3	11	Testing, Deployment & DevOps	Testing & Debugging Techniques	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO4	BT3
3	12	Testing, Deployment & DevOps	State Management Testing & Reliability	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO4	BT4
3	13	Testing, Deployment & DevOps	DevOps Concepts & CI/CD Pipeline	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO5	BT2
3	14	Testing, Deployment & DevOps	Containerization & Cloud Deployment	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO5	BT3

3	15	Testing, Deployment & DevOps	Application Scaling & Monitoring	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO5	BT5

Lecture Plan Preview-Practical

Unit No	ExperimentNo	Experiment Name	Text/ Reference Books	Pedagogical Tool**	Mapped with CO Number(s)	BT Level
1	1	Create a basic SPA using modern frontend framework	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO1	BT3
1	2	Design UI using component libraries (Material UI / Bootstrap)	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO1	BT3
1	3	Implement routing in SPA	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO1	BT3
1	4	Implement state management using Redux / Context API	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports,Simulation,Video Lecture	CO1	BT3

1	5	Optimize frontend performance using lazy loading	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports, Simulation,Video Lecture	CO1	BT4
1	6	Handle forms and validations in frontend	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports, Simulation,Video Lecture	CO1	BT3
1	7	Analyze frontend performance using browser dev tools	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports, Simulation,Video Lecture	CO1	BT4
2	8	Develop RESTful APIs using backend framework	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports, Simulation,Video Lecture	CO2	BT3
2	9	Implement authentication using JWT	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports, Simulation,Video Lecture	CO2	BT3
2	10	Implement role-based authorization	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports, Simulation,Video Lecture	CO2	BT4

2	11	Develop microservice-based backend module	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports, Simulation,Video Lecture	CO2	BT4
2	12	Implement real-time communication using WebSockets	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports, Simulation,Video Lecture	CO2	BT3
2	13	Connect backend with database and perform CRUD operations	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports, Simulation,Video Lecture	CO3	BT3
2	14	Implement secure database queries & validations	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports, Simulation,Video Lecture	CO3	BT4
2	15	Analyze backend performance and scalability	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports, Simulation,Video Lecture	CO2	BT4
3	16	Perform unit testing for frontend/backend modules	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports, Simulation,Video Lecture	CO4	BT3

3	17	Perform API testing using Postman	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports, Simulation,Video Lecture	CO4	BT3
3	18	Debug full-stack application issues	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports, Simulation,Video Lecture	CO4	BT4
3	19	Deploy full-stack application on cloud platform	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports, Simulation,Video Lecture	CO5	BT5
3	20	Implement CI/CD pipeline for application deployment	,T-Full-Stack Web Development wit,T-Learning Full-Stack JavaScript,T-Spring Boot and Spring Cloud M,R-Core Java — Volume I,R-Java Programming Language	Activity,Case Study,Flipped Classes,Infographics,Instructor Lead WorkShop,PPT,Professor of Practice/Adjunct Faculty/Visiting Professor,Reports, Simulation,Video Lecture	CO5	BT6

Assessment Model			
Sr No	Exam Name	Max Marks	Weighted Marks
1	Practical Evaluations	40	20
2	End Term Hybrid Theory	60	30
3	Attendance Marks	2	2
4	Surprise Test	12	4
5	Practical MST	10	4
6	Practical Worksheet/Projects 1	30	2
7	Practical Worksheet/Projects 2	30	2
8	Practical Worksheet/Projects 3	30	2
9	Practical Worksheet/Projects 4	30	2

10	Practical Worksheet/Projects 5	30	2
11	Practical Worksheet/Projects 6	30	2
12	Practical Worksheet/Projects 7	30	2
13	Practical Worksheet/Projects 8	30	2
14	Practical Worksheet/Projects 9	30	2
15	Practical Worksheet/Projects 10	30	2
16	Quiz	4	4
17	Assignment/PBL	10	6
18	MST-1 Hybrid	20	5
19	MST-2 Hybrid	20	5