INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

AI in SOFTWARE ENGINEERING								
VI Semester: CSE / IT								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
ACSE30	**Elective**	3	0	0	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Prerequisites Artificial Intelligence, Software Engineering								

I. COURSE OVERVIEW:

This course explores the integration of Artificial Intelligence (AI) techniques across all phases of the Software Development Life Cycle (SDLC). Students gain both theoretical understanding and hands-on experience in applying AI to requirements engineering, design, coding, testing, deployment, and maintenance. The course emphasizes how AI-driven tools and methods improve software quality, efficiency, and productivity.

II. COURSES OBJECTIVES:

The students will try to learn:

I. The Fundamentals of SDLC and explore how AI can be integrated into its phases.
II. The knowledge of AI techniques such as machine learning, NLP, and deep learning.
III. The AI tools to improve tasks like requirements analysis, design, coding, testing, and maintenance.

III. COURSE OUTCOMES:

At the end of the course, students should be able to:

CO1 Identify the phases of the Software Development Life Cycle (SDLC) and explain the role of Artificial Intelligence in each phase.
CO2 Apply Artificial Intelligence techniques such as Machine Learning, Deep Learning, and Natural Language Processing to software development activities.
CO3 Evaluate and select appropriate AI techniques for solving software engineering problems.
CO4 Design AI-driven workflows and automation strategies to improve software development efficiency.
CO5 Analyze real-world case studies demonstrating the use of AI in SDLC projects.
CO6 Develop and present a mini-project that integrates AI techniques into one or more phases of the SDLC.

IV. COURSE CONTENT:

MODULE – I: Introduction to AI in SDLC (9)

Overview of SDLC (Waterfall, Agile, DevOps, Spiral, V-Model), AI fundamentals: Machine Learning, NLP, Deep Learning, Expert Systems, Evolution of AI in software engineering, Benefits and limitations of using AI in SDLC, Case studies from Google, Microsoft, IBM, etc.

MODULE – II: AI in Requirements and Design Engineering 10)

NLP for requirements gathering and analysis, Automatic requirement classification and prioritization, Chatbots for stakeholder communication, AI for conflict detection and traceability, AI-assisted architectural decision making, Pattern recognition in design (using ML), Design recommendation systems, Code and model generation from high-level specifications.

MODULE – III: AI in Code Generation and Software Construction (10)

Code synthesis and intelligent code completion using Large Language Models (LLMs) and transformer-based architectures; automated bug detection and code smell prediction using machine learning techniques; AI-assisted pair programming tools such as Amazon Code Whisperer and GitHub Copilot; application of Artificial Intelligence in static code analysis and dynamic program analysis for improving software quality.

MODULE - IV: AI in Testing and DevOps (10)

Automated test case generation, Predictive test selection using ML, Fault localization and bug triaging, Reinforcement Learning in test prioritization. AI in CI/CD pipelines, Anomaly detection in logs, Root cause analysis using AI, Predictive maintenance in cloud-native applications, AIOps: Artificial Intelligence for IT Operations.

MODULE-V: AI in Software Maintenance and Ethical Considerations (9)

Change impact analysis, Bug prediction using historical data, Code refactoring using ML models, AI for documentation generation. Explainable AI (XAI) in development lifecycle, AI fairness and accountability, Security and privacy challenges, AI auditability in software systems, Legal and societal impacts of AI in software systems

V. TEXTBOOKS:

1. Brent Laster and Eran Yahav, "The AI-Enabled Software Development Lifecycle (SDLC)",O'Reilly Media, 1st Edition, 2023.
2. Derek Partridge, "Artificial Intelligence and Software Engineering", Glenlake Publishing Company Ltd., 1st Edition, 1991.
3. Hadelin de Ponteves, "Artificial Intelligence A-Z™: Learn How to Build an AI,Udemy ", Edition, 2023.

VI. REFERENCE BOOKS:

1. Ian Sommerville, "Software Engineering", Pearson Education, 10th Edition, 2016.
2. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson Education, 4th Edition, 2020.

VII. ELECTRONICS RESOURCES:

1. https://www.ibm.com/think/topics/ai-in-software-development
2. https://www.zealousys.com/blog/ai-software-development-process/
3. https://kms-solutions.asia/blogs/applying-ai-in-software-development-lifecycle-process
4. https://medium.com/@rama.sathish/ai-powered-software-development-life-cycle-1ac599ad38bb
5. https://www.practicallogix.com/the-future-of-sdlc-how-ai-is-transforming-software-development-processes
6. https://www.calsoftinc.com/blogs/generative-ai-and-the-changing-face-of-software-development-lifecycle

VIII. MATERIALS ONLINE:

1. Course Outline Description
2. Lecture notes
3. PowerPoint presentation
4. Definitions and Terminology

5. Tutorial Question Bank
6. Case Studies
7. Real life Examples
8. Complex Engineering Problems
9. Tech Talk Topics
10. Concept Video Topics
11. Open-ended Exercises
12. Assignments
13. Model Question Paper – I
14. Model Question Paper – II
15. GATE Question Bank
16. Previous Question Papers and Solutions