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The Integration of Artificial Intelligence into Interdisciplinary Engineering Curricula and Industry Readiness

M. V. Waghmare[1], S. H. Wankhade[2], D. S. Bormane[3]
[1] **Associate Professor, AISSMS College of Engineering, SPPU, Pune**
[2] **Professor, AISSMS College of Engineering, SPPU, Pune**
[3] **Professor, AISSMS College of Engineering, SPPU, Pune**

mvwaghmare@aissmscoe.com

Abstract

The integration of Artificial Intelligence (AI) into interdisciplinary engineering curricula is highly relevant in modern higher education. AI aligns education with Industry 4.0 by equipping students with skills in automation, data analytics, and smart systems. It promotes collaboration across civil, mechanical, electrical, IT, and chemical domains, enabling projects such as smart cities, autonomous robots, and healthcare IoT. AI enhances research through predictive modelling, simulations, and optimizations while fostering employability and entrepreneurship. Furthermore, AI supports personalized learning and adaptive assessments. This article presents a case study from AISSMS College of Engineering, illustrating the integration of AI, IoT, TRIZ and other professional student chapters to align postgraduate curricula with industry needs, making curriculum National Education Policy (NEP 2020) compliant. It also addresses challenges, ethical considerations, and governance policies for responsible adoption. Findings indicate that AI, when implemented with structured oversight, enhances industry readiness, academic quality, and holistic student development.

Keywords—Artificial Intelligence (AI), Curriculum Innovation, Industry-Relevant Content, Employability, Higher Education, TRIZ, IoT, IUCEE, Professional Student Chapters

1. Introduction

Higher education is undergoing a transformation due to rapid technological change and the demands of Industry 4.0/5.0. Traditional curricula often remain static, are reviewed infrequently, and fail to respond effectively to evolving industry needs. This mismatch creates a critical skills gap threatening employability and competitiveness.

Artificial Intelligence (AI) is emerging as a key enabler of curriculum innovation by supporting evidence-based, adaptive, and industry-relevant education. Applications include analysing labour market trends, generating dynamic course materials, and personalising learning pathways. AI also assists educators by providing data-driven insights into teaching and assessment strategies.

This paper explores AI's role in reshaping curricula for interdisciplinary engineering education, with emphasis on industry readiness, ethical considerations, and institutional preparedness. A case study from AISSMS College of Engineering highlights practical curriculum innovations and professional chapter initiatives.

2. Literature Review

Researchers increasingly recognise AI's potential to transform higher education. Zawacki-Richter et al. (2023) identify four major applications: intelligent tutoring, predictive systems, automated assessments, and adaptive learning. Sivarajah et al. (2023) report exponential growth in AI-related education research, particularly in adaptive learning and skill prediction.

AI also facilitates dynamic curriculum design. Alam et al. (2024) highlight its capacity to integrate industry-relevant skills through labour market analysis, while cautioning against ethical risks such as algorithmic bias. Similarly, Muneer et al. (2024) emphasise faculty readiness and institutional support as prerequisites for successful implementation.

Practical integration models exist. Shankar et al. (2023) describe the University of Florida's "AI Across the Curriculum" program, embedding AI literacy into diverse disciplines to boost employability. Studies consistently show that AI enhances student engagement, retention, and adaptability while raising questions of transparency, governance, and inclusivity.

Vanitha, Banu, and Dhanaselvam (2025), in their paper *Productive learning: CDIO project-based learning (PBL) assessment strategy for microcontroller course in engineering curriculum* demonstrate how integrating the CDIO framework with project-based learning enhances students' problem-solving abilities, practical skills, and industry readiness. The study highlights innovative assessment strategies that support productive learning outcomes and align with emerging AI-driven approaches to curriculum innovation.

3. Curriculum Design and Interdisciplinary Applications

The All India Council for Technical Education (AICTE) declared 2025 the "Year of AI," initiating AI-driven curriculum innovation nationwide. Unlike static curricula, AI enables real-time benchmarking and integration of industry demands (Alam et al., 2024).

3.1 Interdisciplinary Integration

Modern industries increasingly require graduates to possess interdisciplinary expertise, blending technical, managerial, and ethical competencies. AI can facilitate this by mapping connections across diverse knowledge domains. For instance, algorithms can recommend the inclusion of modules that combine business analytics with artificial intelligence, or ethics with computer science. According to Shankar et al. [5], the "AI Across the Curriculum" model implemented at

the University of Florida illustrates how AI literacy can be embedded across multiple disciplines, preparing students for a variety of career pathways.

i. Civil Engineering: AI in smart city planning, traffic prediction, flood forecasting, and structural health monitoring. Projects using machine learning on geotechnical or seismic datasets; AI-based design optimization in CAD/BIM tools.
ii. Mechanical Engineering: AI in robotics, additive manufacturing, digital twins, and predictive maintenance. AI-powered simulations for stress analysis, CNC machine learning for fault detection.
iii. Electrical & Electronics Engineering: AI in smart grids, IoT devices, renewable energy forecasting, VLSI design optimization. Use of neural networks for power load forecasting, AI for embedded systems.
iv. Computer & IT Engineering: Machine learning, deep learning, natural language processing, cybersecurity with AI. The AI-based intrusion detection systems, recommender systems, and chatbot development.
v. Chemical Engineering: AI in process optimization, sustainable manufacturing, and smart materials. AI-based predictive modeling in chemical reactors and safety systems.

3.2 Case Study: AISSMS College of Engineering

At AISSMS, postgraduate programs integrate AI, Automation, and IoT across non-computer branches (e.g., civil engineering). TRIZ (Theory of Inventive Problem Solving) is incorporated to foster innovation. The curriculum is made NEP 2020 compliant. Various courses such as "Generative AI for ALL", "Introduction to Entrepreneurial Thinking" "Introduction to Design Thinking" are conducted by the student chapter of Indo Universal Collaboration for Engineering Education (IUCEE). These programmes help students to be aware of AI and become industry-ready. Professional student chapters organize workshops, certifications, and competitions, providing hands-on exposure to industry practices. This model demonstrates how AI-enabled curriculum design can improve employability and professional readiness.

AI helps embed certifications and standards (e.g., PMP, AWS, LEED) into academic curricula, providing students with dual credentials. At AISSMS, professional student chapters bridge academia-industry gaps by hosting seminars, hackathons, and certification programs. These AI-supported and experiential activities prepare students for global job markets by enhancing technical and soft skills simultaneously.

4. Challenges and Ethical Considerations

Despite its benefits, AI integration poses challenges:

- **Equity**: Risk of algorithmic bias reinforcing inequalities (Alam et al., 2024).
- **Faculty Readiness**: Institutional training and infrastructure gaps (Muneer et al., 2024).
- **Human Oversight**: AI should complement, not replace, instructors. Educators must remain central to curriculum design and assessment validation.

- Responsible adoption requires governance frameworks, ethical safeguards, and accreditation-linked implementation strategies (Shankar et al., 2023).

Conclusion

- AI is reshaping higher education by enabling curriculum innovation, personalization, and interdisciplinary industry readiness. The AISSMS case study illustrates practical pathways—integrating AI, IoT, TRIZ and professional chapters—to foster employability and holistic student development.
- However, successful implementation demands ethical oversight, faculty training, and governance structures. AI should enhance rather than replace human judgment. With strategic adoption, institutions can bridge academia-industry gaps while maintaining educational quality, inclusivity, and innovation.

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