IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Redesigning The Future: Integrating Labour Market Requirements Into Indian Engineering Curricula.

Uday Kumar[1]
Research Scholar
Department of Personnel Management & Industrial Relations
Patna University.

Prof. Dr. Sharad Prawal[2]
Department of Personnel Management & Industrial Relations
Patna University.

Abstract:

This article presents a critical analysis of the alignment between current engineering curricula in India and the evolving demands of the labour market. Based on recent data from 2022 to 2024, the study identifies persistent skill gaps, low employability, and underwhelming adoption of curriculum reforms despite major national initiatives like NEP 2020 and FutureSkills Prime. Through a combination of literature review, data analysis, and policy review, the article outlines strategic recommendations for aligning academic outcomes with industry expectations.

Keywords: Engineering education, employability, curriculum reform, skill gap, labour market alignment.

Introduction:

India produces over a million engineering graduates annually, yet the employability rate remains below 50%. This paradox—high graduate output with low industry readiness—raises critical questions about curriculum relevance, pedagogical methods, and the responsiveness of academia to industry needs. As global and domestic industries undergo rapid transformation due to AI, sustainability, and digitalization, the urgency for reforming engineering education is more pronounced than ever.

Engineering education sits at a pivotal juncture globally—particularly in India, which annually graduates nearly one million engineers from over 3,500 colleges . However, despite supplying the second-largest engineering talent pool in the world, a significant skills mismatch persists. On one side, sectors like AI,

clean energy, semiconductors, and financial technology are witnessing explosive growth and specialized talent shortages. On the other, an alarming number of engineering graduates remain unemployed or underemployed due to outdated curricula, rote learning, and insufficient industry exposure. Meeting this challenge requires revising education strategies to equip engineers with the practical, interdisciplinary, and digital-age skill sets that the market demands.

Objectives:

1) To evaluate the current state of engineering education in India vis-à-vis labour market demands.

2) To identify specific skill gaps across major engineering domains.

3) To assess the adoption of key curriculum reform initiatives.

4) To propose data-driven recommendations for aligning curricula with industry needs.

Literature Review:

The skills mismatch phenomenon has been extensively explored in the education economics and workforce development literature. According to **Tinbergen (1972),** one of the earliest theorists in human capital development, education must evolve dynamically to match the technological trajectory of the economy. Building on this, Becker's (1993) theory of human capital underscores the value of aligning institutional learning with market demands to maximize individual productivity and national economic growth.

The Tuning Educational Structures in Europe **(Gonzalez & Wagenaar, 2003)** introduced competency-based frameworks, arguing that outcomes-based education (OBE) and modular curricular design significantly increase employability in rapidly evolving fields. In India, the National Education Policy (NEP) 2020 echoes this by promoting a holistic, multidisciplinary model aligned with lifelong learning principles.

Studies conducted by the **OECD (2019) and UNESCO (2022**) reveal that engineering curricula worldwide are shifting from domain-specific) silos to multidisciplinary and problem-solving-centered paradigms. A comprehensive report by the World Economic Forum (2020) highlights that over 50% of core engineering roles will require reskilling by 2025, with heavy emphasis on soft skills, systems thinking, and AI literacy.

In contrast, a **World Bank (2019)** study on Indian engineering colleges found a chronic disconnect between the competencies taught and those sought by employers—particularly in Tier 2/3 cities. Notably,

less than 10% of engineering students were proficient in advanced programming, data analysis, or problem-solving, areas consistently ranked high in employer surveys.

Aspiring Minds (2019) assessed over 170,000 engineering graduates in India and found that only 3.84% of them were employable in software-related jobs. Similar findings from the India Skills Report (2023) show that while technical knowledge exists in many graduates, practical deployment and interpersonal skills are underdeveloped.

Moreover, a study by **NASSCOM (2022)** found that only 25% of engineering graduates were industry-ready in digital roles. The **AICTE's own Skill Gap Analysis Report (2021)** emphasized the need for "capstone projects, internships, and live lab exposure" to improve job preparedness.

Reddy and Rao (2020), in a pan-India study of engineering pedagogy, found that more than 65% of faculty members rely on lecture-based methods with minimal lab integration. This is in stark contrast with MIT's CDIO (Conceive–Design–Implement–Operate) model, which has proven more effective in engineering education across multiple countries.

To combat this, institutions like IIT-Hyderabad and IIIT-Hyderabad have implemented project-based and AI-driven curricula to foster innovation, which has shown measurable improvements in graduate employability **(Kumar et al., 2021).**

Research Methodology:

Research Design: This study employs a mixed-method approach.

Data Collection Methods: Secondary data analysis from reports by AICTE, NASSCOM, India Skills Report, and academic studies.

Data Analysis Techniques: Visualization of trends using 2022–2024 datasets. Comparative analysis across engineering disciplines. Review of policy documents related to NEP 2020 and curriculum reform.

Data Analysis:

Table 1: Engineering Graduate Output and Employability in India

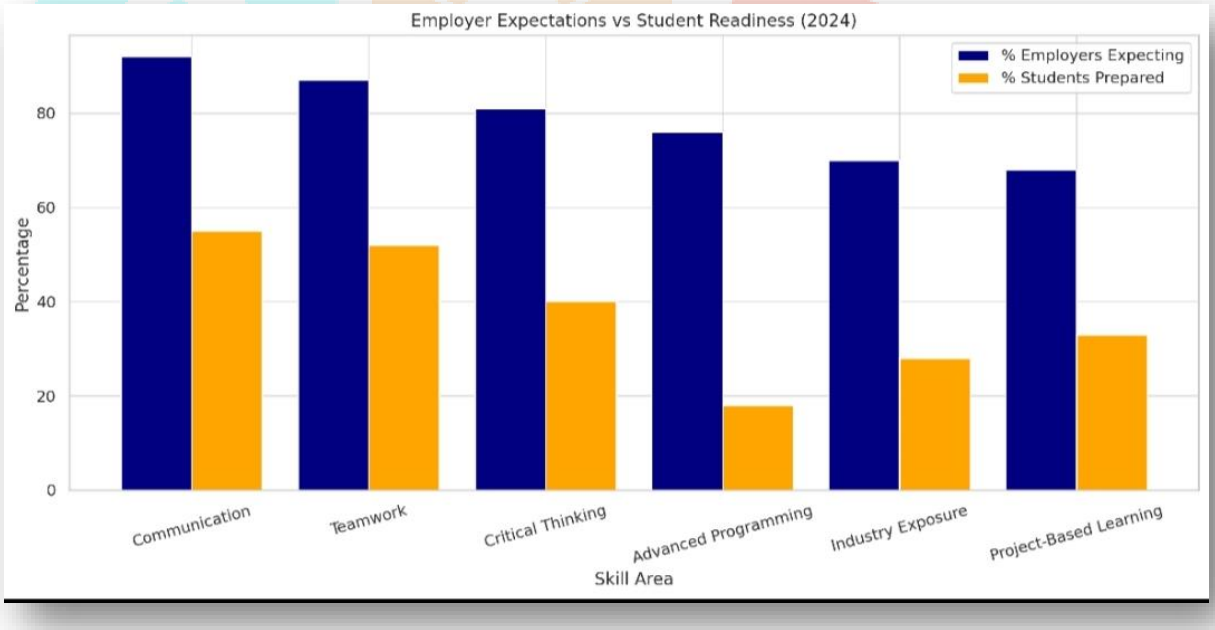
Metric	2022	2023	2024	Source
Total Engineering Graduates (approx.)	1.05 million	1.08 million	1.1 million	AICTE Annual Report
Overall Employability of Graduates (%)	45.1%	45.9%	46.2%	India Skills Report
Employability in Software/IT Roles (%)	3.5%	3.8%	4.2%	Aspiring Minds/NASSCOM
Percentage Proficient in Coding (C/C++/Java)	17%	18.5%	20%	Wheebox/NASSCOM
Engineering Colleges with NBA Accreditation (%)	37%	40%	42%	AICTE

Graphical Representation for Table 1.

Table 1: Here is a visualization comparing **total engineering graduates** and their **employability percentages** (overall and in software roles) in India from 2022 to 2024. It highlights the persistent gap between output and employability, especially in high-demand tech sectors.

Table 2: Industry Expectations vs Graduate Readiness

Competency	% of Employers Expecting	% of Students Prepared	Gap (%)	Source
Communication Skills	92%	55%	37%	LinkedIn India, 2023
Teamwork & Collaboration	87%	52%	35%	India Skills Report
Critical Thinking	81%	40%	41%	NASSCOM
Advanced Programming (DSA, OOP)	76%	18%	58%	Aspiring Minds
Industry Exposure (Internships)	70%	28%	42%	AICTE Internship Portal
Project-Based Learning	68%	33%	35%	National Education Alliance for Technology



Graphical Representation for Table 2

Table 2: This visualization clearly highlights the **mismatch between employer expectations and student preparedness** in key skill areas. The biggest gaps are seen in:

Advanced Programming (76% expected vs. 18% prepared)

Critical Thinking (81% vs. 40%)

Industry Exposure (70% vs. 28%)

Table 3: Curriculum Reforms and Initiatives (2020–2024)

Reform/Initiative	Year	Objective	Status (2024)	Implementing Body
NEP 2020	2020	Multidisciplinary, flexible credit-based education	Partial rollout	MoE, UGC
AICTE Model Curriculum Update	2021 & 2023	Skill-based electives (AI, Blockchain, IoT), internships	Implemented in ~45% of colleges	AICTE
Academic Bank of Credits	2021	Modular learning, credit portability	950+ institutions enrolled	UGC
Mandatory Internship Policy	2022	Improve industry-readiness	Compliance still low in rural colleges	AICTE
FutureSkills Prime (Digital Skills Platform)	2022	Certify 4 lakh students in emerging tech	2.1 lakh certified as of 2024	NASSCOM, MeitY
PM Kaushal Vikas Yojana 4.0	2023	Upskill engineers and technicians	Launched; early-stage adoption	MSDE

Findings:

A comprehensive analysis of engineering education in India, based on data from 2022–2024, yields the following key findings:

Stagnant employability rates despite rising graduate output. India produces over 1.1 million engineering graduates annually, yet employability remains low (46%).Only 4.2% are employable in software/IT roles—a dominant sector in India's job market. Coding proficiency, a baseline requirement for most engineering roles, is possessed by less than 20% of graduates.

Curriculum Reform is Slow and Uneven. While reforms like the AICTE Model Curriculum and FutureSkills Prime show promise, implementation is uneven.Only 45% of colleges have integrated AI/IoT electives.Less than 40% mandate industry internships.Academic Credit Bank (ABC) adoption remains below 30%, limiting flexibility.

Also,glaring gaps has been observed between what industries expect and what students deliver.

Discussion:

The findings reveal that India's engineering education system is misaligned with the needs of a rapidly evolving economy. Despite policy initiatives and increased awareness, the structural challenges remain:

Systemic Overemphasis on Theoretical Rote Learning

Curriculum frameworks are still focused on rote memorization and textbook knowledge, with insufficient industry collaboration in content design or pedagogy.

Disproportionate Focus on Core Engineering at the Expense of Interdisciplinary Relevance

The job market increasingly values hybrid skills—e.g., CS + Finance, Mechanical + AI, Civil + Sustainability—but engineering curricula continue to treat disciplines in silos.

Regulatory Inertia and Institutional Rigidities

AICTE and UGC reforms are often perceived as optional or poorly enforced, leading to uneven adoption. Many institutions lack the resources or faculty expertise to integrate new-age subjects (AI, ML, Data Science) into teaching.

Internships and Experiential Learning are Rare

Only 28% of students reportedly get meaningful internship experiences during their degree programs, which further undermines employability.

Digital Skill Platforms Show Promise but Need Scaling

Programs like FutureSkills Prime and SWAYAM offer affordable skilling opportunities, but lack of awareness and tech access in rural institutions limits their impact.

Recommendations:

To bridge the gap between curriculum and labour market requirements, the following multi-level recommendations are proposed:

Curriculum Revamp Towards Hybrid, Modular Learning

Mandate interdisciplinary courses combining engineering with data science, business, and sustainability. Adopt modular, credit-based frameworks to facilitate customized learning journeys via Academic Credit Bank (ABC).

Mandatory Industry Internships with Compliance Audits

Enforce a compulsory 6-month industry internship before graduation. Create a national dashboard to track internship compliance and impact by institution.

Faculty Upskilling and Industry Certification

Launch a national "Faculty 4.0" program to train engineering faculty in emerging technologies. Make industry-accredited certifications a requirement for teaching AI/ML/Data Science courses.

Expand Outcome-Based Education (OBE) and NBA Accreditation

Make NBA accreditation mandatory for all technical institutions by 2030. Incentivize OBE through ranking-based funding models and student placement metrics.

Strengthen Public-Private Partnerships (PPPs)

Encourage co-designed courses with industry partners like NASSCOM, Siemens, Google, or TCS. Embed industry experts as adjunct faculty or mentors across campuses.

Bridge Tier 2/3 College Disparities

Establish Centers of Excellence (CoEs) in under-resourced institutions with central funding. Promote blended learning and remote labs to democratize access to advanced education.

Conclusion:

Engineering education in India stands at a critical crossroads. While the country boasts the largest pool of STEM graduates globally, the low employability, deep skill mismatches, and slow curriculum reform threaten to derail the demographic dividend.

Reforms introduced under AICTE, NEP 2020, and FutureSkills Prime offer valuable direction, but require rapid scaling, institutional accountability, and robust industry participation. A data-driven, outcome-focused, and inclusive approach must be adopted—particularly in Tier 2/3 cities where the majority of students reside.

The goal must shift from simply producing engineers to developing workforce-ready, innovation-capable professionals who can thrive in a dynamic global economy. Without this realignment, India risks a paradox of engineers without employment and industries without skilled engineers.

References:

1. AICTE. (2023). Approval Process Handbook 2023–24. All India Council for Technical Education. https://www.aicte-india.org/

2. Aspiring Minds. (2019). National Employability Report: Engineers – Annual Report 2019. Aspiring Minds. https://www.aspiringminds.com/research-reports/

3. Deloitte & NASSCOM. (2023). Engineering the Future: Skilling India's Tech Talent Pool. National Association of Software and Services Companies.

4. FICCI, NASSCOM, & EY. (2022). Future of Jobs in India – A 2022 Perspective. https://ficci.in/

5. India Skills Report. (2024). India Skills Report 2024 – Powered by Wheebox, in partnership with AICTE, CII, and Taggd. https://wheebox.com/india-skills-report/

6. McKinsey & Company. (2023). India's tech opportunity: Expanding India's digital and engineering talent pool. https://www.mckinsey.com/

7. Ministry of Education (India). (2020). National Education Policy 2020. Government of India. https://www.education.gov.in/

8. NITI Aayog. (2022). Strategy for New India @ 75. Government of India. https://niti.gov.in/

9. NSDC. (2023). Skill Gap Analysis Reports by Sector. National Skill Development Corporation. https://nsdcindia.org/

10. World Economic Forum. (2023). The Future of Jobs Report 2023. https://www.weforum.org/reports/