A Study on Engineering Students' Perception and Challenges towards Completing Mandatory Professional and Open Electives through NPTEL

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Abstract- Today's education system emphasizes digital learning platforms to enhance students' knowledge and employability skills, and with the introduction of SWAYAM–NPTEL courses as the mandatory professional and open electives, engineering students are encouraged to adopt self-directed and flexible learning methods; however, the effectiveness of these courses depends on students' perception and the challenges faced during completion. The objective of this study is to examine the perception of engineering students towards mandatory NPTEL courses and to analyze the challenges encountered by them at G. Pullaiah College of Engineering and Technology (GPCET), Kurnool, by focusing on key factors such as learning value, course quality, certification value, institutional support, assessment system, and learner effort. The study is based on primary data collected through a structured questionnaire using convenience sampling, and the data were analyzed using descriptive and regression analysis. The results reveal that students generally hold a positive perception towards NPTEL courses as they enhance subject knowledge, promote self-learning, and help bridge the gap between academic learning and industry requirements, though challenges such as difficulty in understanding course content, time constraints, and pressure of mandatory credit completion still persist. Hence, the study concludes that NPTEL courses significantly contribute to improving students' learning outcomes and employability, while emphasizing the need for better institutional support, effective guidance, and improved course design to maximize their benefits.

Key Words: NPTEL, SWAYAM, Student Perception, Online Learning Platforms, Engineering Education, Employability Skills.

I.INTRODUCTION

Online learning is a technology-enabled system of education in which teaching and learning activities are conducted through digital platforms using internet connectivity. It allows learners to access academic content, instructional materials, and assessments without being physically present in a traditional classroom environment. Online learning has transformed the educational landscape by introducing flexibility, accessibility, and innovation into the teaching–learning process. Unlike conventional classroom education, which requires fixed schedules and physical attendance, online learning provides learners with the freedom to study at their own pace and convenience. It uses electronic devices such as computers, laptops, tablets, and smart phones to deliver educational content through Learning Management Systems, virtual classrooms, video conferencing platforms, and mobile applications.

Online learning represents a shift from teacher-centered instruction to learner-centered education. In this model, students actively participate in their learning process, manage their time independently, and take responsibility for completing coursework. It promotes self- discipline, critical thinking, and digital literacy, which are essential skills in the modern knowledge-based economy. In higher education, especially in engineering and technical disciplines, online learning has become increasingly important. It provides access to expert faculty, standardized curriculum, and advanced knowledge that may not always be available within a single institution. As a result, online learning is no longer considered merely supplementary; it has

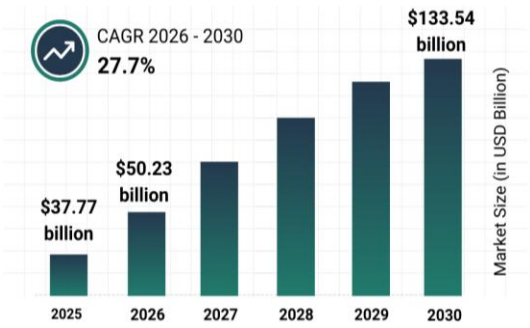
become an integral component of formal education systems.

II.INDIA'S GROWING DIGITAL LEARNING ECOSYSTEM

India is the second largest market for e-learning after the United States (US). The Indian Edtech industry, valued at Rs. 1,10,198 crore (US$ 12.75 billion) in 2024, is projected to surpass Rs. 5,29,384 crore (US$ 61.25 billion) by 2035, as per Market Research Future. Yet a significant portion of this growth lies not within formal Edtech apps, but in free content, delivered by individual educators on other platforms such as YouTube and LinkedIn.

In 2024, India had more than 886 million internet users, of which 55% belonged to rural areas. This growth is supported by some of the world's lowest mobile data costs with one gigabyte (GB) of data costing around Rs. 13.98 (US$ 0.16). Digital learning is a routine experience for a large section of the country. Amid this growth, YouTube has emerged as India's largest informal learning platform, offering flexible, affordable, and relatable educational content. Learning-related videos generate millions of views every day, with a major share of this traffic coming from small towns. This user base has turned informal online education into a full-fledged learning system.

Figure-1: Market Size of Education sector in India



(Source: *Digital Education Market Report 2026*)

III.EVOLUTION OF ONLINE LEARNING

The development of online learning has been gradual and progressive, evolving from traditional distance education models to sophisticated digital ecosystems integrated within formal academic frameworks.

1. Correspondence Education Era: The earliest form of the distance education emerged through correspondence courses in the late 19th and early 20th centuries. Study materials were distributed via postal services, and Students submitted assignments through mail. Although flexible, this system lacked real-time interaction and immediate academic feedback.
2. Radio and Television-Based Learning: During the mid-20th century, educational institutions began utilizing radio and television broad casts to disseminate lectures. This expanded educational reach but remained largely one- directional, offering minimal opportunities for student participation.
3. Computer-Based Training (CBT): With the rise of personal computers in the 1980s and 1990s, educational content began to be delivered through CD-ROMs and computer software. Multimedia elements such as graphics, audio narration, and interactive exercises enhanced learner engagement compared to earlier methods.
4. Internet-Based Learning: The emergence of the internet revolutionized educational delivery. Learning Management Systems (LMS) such as Blackboard and Moodle enabled institutions to manage coursework, host discussions, conduct assessments, and monitor student performance digitally. This marked transition from static content to interactive online system.
5. Emergence of MOOCs: In 2008, Massive Open Online Courses (MOOCs) marked a significant turning point in digital education. Platforms such as Coursera, edX, and Udacity provided open access to courses offered by prestigious global universities. MOOCs democratized education by making high- quality academic content accessible to learners worldwide at minimal or no cost.
6. Integration into Formal Education: Over time, governments and regulatory bodies recognized the academic potential of online learning. Policies were introduced to enable credit transfer and formal recognition of online courses within university curricula. This institutional integration enhanced the credibility and acceptance of digital education system.
7. Post-COVID Digital Expansion: The COVID-19 pandemic accelerated the adoption of online learning globally. Educational institutions shifted to virtual teaching models to ensure academic continuity. This period demonstrated the resilience

and effectiveness of digital learning systems, leading to permanent structural changes in higher education delivery.

IV.REVIEW OF LITERATURE

Suman Kalyan Panja (2025)[1] has made an endeavour to investigate "How have the SWAYAM MOOCs impacted Indian higher education? An inquiry through data mining approach". The study examined the impact of SWAYAM MOOCs on Indian Higher Education using platform-level course data. The findings revealed a significant imbalance in course contributions among national coordinators, with NPTEL and CEC together accounting for nearly 74 per cent of SWAYAM courses. The results showed that 95 per cent of the courses are offered at the higher education level, with very limited coverage for school education. The study also found that most courses are advanced in nature, largely transferable for academic credit, and predominantly cater to STEM disciplines, while areas such as law, health sciences, architecture, and teacher education remain under represented. The analysis was carried out using a data mining approach supported by descriptive statistical analysis of 1,170 SWAYAM courses.

Riddhi Singh and Rajeev Singh Bhandari (2025)[2]conducted a study on "Students' Awareness and Usage of SWAYAM – NPTEL in Higher Education". The findings of the study reveal a high level of student awareness of the SWAYAM–NPTEL platform, with moderate enrolment and a comparatively high rate of certification completion. Enrollment was predominantly concentrated in engineering and computer science courses, while learners expressed strong satisfaction with course relevance and content quality. The results indicate minimal challenges in platform usage and reflect a positive perception regarding employer recognition of SWAYAM-NPTEL certifications. The research adopted a descriptive research design and employed stratified random sampling, with data analysed using descriptive statistical tools such as frequencies and percentages.

Priyanka Jarialet al. (2025)[3]were carried out research study entitled "The effectiveness of MOOCs in Technical Education: An Indian perspective". The study reports that students' learning outcomes are significantly enhanced when MOOCs provide well-structured course content, adequate technological support, teacher student interaction, and regular feedback. It also finds that performance evaluation and learner engagement positively affect MOOC effectiveness. The SEM results confirm that all eight identified factors contribute directly or indirectly to learning effectiveness, highlighting that course design and interaction are the most influential. For analysis, the authors used SPSS for descriptive statistics, reliability testing, exploratory and confirmatory factor analysis, and Structural Equation Modeling (SEM) with Smart PLS.

Lakshmi G V and Rajeshwari (2024)[4] in their examination on "Impact of Online Learning Platforms in Enhancing Employees' Skills and Knowledge in Academia". The study demonstrates that online platforms like Coursera, NPTEL, LinkedIn Learning, and Udemy contribute to educators' skill and knowledge enhancement, providing flexible professional development opportunities. It reveals that balancing work and learning remains a challenge; with 56.2% of participants dissatisfied with long-term career grow than skill advancement. The findings emphasize the need for more interactive features, practical learning experiences, and improved course content to maximize professional upskilling. For analysis, the authors applied quantitative and descriptive methods using Correlation, Chi- Square tests, and ANOVA to evaluate platform effectiveness.

Arora, Santosh, D. Bansaland Swati Bansal (2024)[5] in their exploration on "A Study of Awareness and Perception Regarding MOOC Courses with Special Reference to NPTEL". The study finds that receiving the certificate, convenience of timing and location, and subject mastery were the main perceived benefits of NPTEL courses. The major reasons for not completing courses were time constraints, poor course selection, and loss of momentum. The results also show that gender is independent of awareness, while qualification influences it. The study recommends blended learning, increased awareness campaigns, and careful course selection to improve completion rates and enhancecareer prospects. For analysis, the authors used structured questionnaires, with descriptive statistics and Chi- Square tests applied to the responses from 379 students.

Shipra Gupta, Amala and Sunil (2024)[6]in their article "Impact of MOOC Participation on Career Advancement and Skills Development". The study finds that MOOCs improve career prospects, employability, and skills, delivering high-quality

education especially for learners without access to traditional systems. Platforms like SWAYAM, XuetangX, Coursera, and edX are shown to provide flexible and accessible learning opportunities. For analysis, a descriptive research approach was applied, using secondary data and cross- country MOOC adoption statistics.

Kishore, Amita and Rajeev Roushan (2024)[7]in their study entitled "A Comparative Analysis of India's Two Leading Digital Learning Platforms: NPTEL and SWAYAM". Reveals that NPTEL and SWAYAM have reshaped the Indian education system by offering flexible, inclusive, and technology -driven learning. It demonstrates that these platforms enhance access to quality education, support lifelong learning, and cater to diverse learner needs. The analysis also compares the platforms' course variety, learner engagement, and scalability. For analysis, the authors employed descriptive methods using secondary data and platform performance metrics.

Arfia Aman(2024)[8] in the study titled *"*A Review on E-learning and Employability Skills*"*, examined the role of e-learning in developing employability competencies. The study under scores that digital learning environments support employability by providing flexible, accessible, and skill-focused learning experiences. It demonstrates that e-learning platforms contribute to career preparedness, professional growth, and lifelong learning, enabling learners to adapt to changing workplace requirements. For analysis, the author adopted a systematic literature review method, synthesizing evidence from prior studies related to e- learning practices and employability skill development.

Bargavi and Shanmugam (2023)[9]intheir teaching case titled *"*Does NPTEL Enhance E- learning in India? A Case Study on Status and Deterrents", examined the role of NPTEL in strengthening India's e-learning landscape. The study explains how NPTEL supports technology-enabled learning by providing accessible MOOCs that promote lifelong learning and skill development. At the same time, it brings out key deterrents to NPTEL usage, such as limited awareness, learner engagement issues, infrastructural constraints, and challenges in course completion. The study adopted a case study approach, relying on descriptive analysis of secondary data, institutional reports, and policy documents to assess the status, initiatives, growth, and limitations of NPTEL in enhancing e-learning in India.

Anju Kaicker, Pranav Mathur, and Sumaiya Jawed (2022)[10] explored "Higher Education in India through MOOCs and Online Courses, "focusing on the growth of online education over the past decade. Their study highlights how MOOCs, especially SWAYAM, have improved access to higher education, boosted employability, and promoted international collaborations, while also identifying challenges in online learning. Using descriptive and comparative analysis of secondary data, they conclude that MOOCs significantly supporting higher education and professional opportunities in India despite limitations.

Malik and Annalakshmi (2022)[11]has made an endeavour to investigate the "Turning Challenges into Opportunities: Flexible Learning Pathways In

Indian Higher Education highlights that flexible learning pathways enhanceaccess, inclusivity, and lifelong learning in Indian higher education. The study shows that mechanisms such as credit transfer, modular learning, and recognition of prior learning support learner mobility and align higher education reforms with SDG-4 goals. For analysis, the study employed a qualitative case study approach based on stocktaking, survey evidence, and country-level documentation under the IIEP-UNESCO framework.

V.STATEMENT OF THE PROBLEM

Earlier, the education system in India was classroom-based, with no initiatives like AICTE or digital learning platforms such as SWAYAM and NPTEL. As technology advanced, digital learning emerged, and many universities began adopting online courses and digital platforms to enhance learning and provide flexible, high-quality education. Earlier studies mainly focused on the general benefits and challenges of online education, but no study has explored students' real-life experiences with compulsory courses at specific institutions. To fill this gap, this study aims to examine engineering students' perceptions and challenges in completing mandatory SWAYAM–NPTEL courses at GPCET College, which operates under Jawaharlal Nehru Technology University Anantapur (JNTUA), where SWAYAM courses were officially integrated into the academic curriculum for credit transfer as part of mandatory electives starting from the 2017–2018 academic year, aligning with the introduction of R15/R17 regulations for under graduate engineering

programs and following nationwide encouragement from the Ministry of Human Resource Development. To address this, the present study seeks to answer the following questions: What are the perceptions of engineering students of GPCET regarding mandatory SWAYAM–NPTEL courses? What challenges do they encounter in completing these courses at GPCET College, under JNTU Anantapur (JNTUA)? How well do these courses achieve the intended academic objectives since their integration in the 2017–18 academic years under R15/R17 regulations?

VI.NEED AND SIGNIFICANCE OF THE STUDY

Criteria for Selection of Topic: The topic was selected due to the growing importance of SWAYAM–NPTEL courses as mandatory professional and open electives in engineering education. Understanding students' perceptions and challenges in completing compulsory online courses is essential, as these factors directly influence learning effectiveness and academic outcomes. Existing studies mainly focus on awareness and effectiveness of MOOCs, while limited attention has been given to students' experiences when such courses are mandatory. Therefore, the selected topic addresses a relevant research gap and holds academic and practical significance.

Criteria for Selection of Region: The region G. Pullaiah College of Engineering and Technology (GPCET), Kurnool was chosen because the institution has implemented mandatory SWAYAM–NPTEL electives as part of its engineering curriculum. The availability of engineering students who have completed these courses ensures feasible primary data collection. Moreover, the absence of institution-specific studies on mandatory NPTEL electives at GPCET makes the region suitable for generating focused and context-specific insights within the given time and resource constraints.

VII.SCOPE OF THE STUDY

This research aims to explore engineering students' perceptions and challenges in completing mandatory professional and open electives through NPTEL at GPCET College, Kurnool. This study focuses on courses prescribed as compulsory electives within the under graduate engineering curriculum. It examines factors such as engagement with course content, assessment requirements, certification procedures, time management, institutional guidance, and learner involvement, in so far as they affect students' perceptions and challenges. The study is limited to undergraduate engineering students at GPCET College, Kurnool.

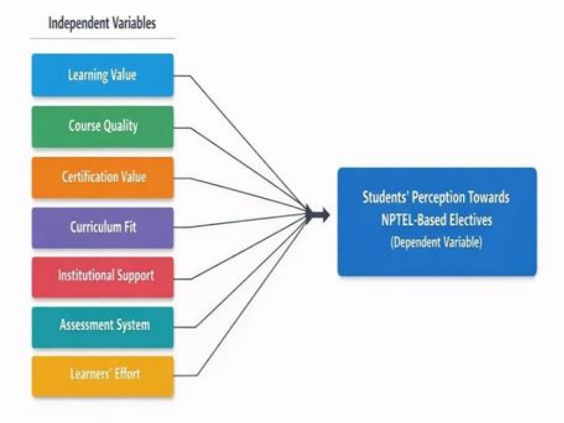


Figure-2: Conceptual Framework
Source: Adapted from (Jarial et al., 2025), (Singh & Bhandari, 2025), (Gupta et al., 2024), (Malik & Annalakshmi, 2022).

VIII.OBJECTIVES OF THE STUDY

1. To study the concept of students' perception and challenges on professional and open electives through NPTEL.
2. To examine the socio-economic profile of the students.
3. To identify the factors that influence student's perception, participation in NPTEL-based electives.
4. To analyze the impact of learning value on engineering students' perception towards mandatory NPTEL-based electives.

HYPOTHESIS

Based on the above objectives the following hypotheses are formulated:

H_0: There is no significant impact of learning value on engineering students' perception towards mandatory NPTEL-based electives.

H_1: There is a significant impact of learning value on engineering students' perception towards mandatory NPTEL-based electives.

IX.RESEARCH METHODOLOGY

The present study adopted a descriptive research design to describe engineering students' perceptions and challenges related to completing mandatory professional and open electives through NPTEL.

Data Source: Both primary and secondary data are used for the present study.

Sampling Technique: Non-probability Convenience sampling method is adopted to collect the data from engineering students of G Pullaiah College of Engineering and Technology, Kurnool.

Sample Size: The sample size for the study consists of 107 respondents.

Data Collection Method: Primary data are collected through structured questionnaire and it is shared among the Engineering students of GPCET to know "Engineering Students perceptions and challenges in completing mandatory professional and open electives through NPTEL at G. Pullaiah college of Engineering and Technology, Kurnool. Secondary data are gathered from journals, research articles, and official NPTEL documents.

Statistical Tools and Techniques: The collected data are analyzed and interpreted using descriptive statistics and regression analysis with the help of SPSS software and Excel tools.

Data Analysis and Results

The reliability of 389 respondents was assessed using the questionnaire. The Cronbach's Alpha value is 0.872 which is good and significant.

Table-1: Reliability and Validity

Case Processing Summary			
		N	%
Cases	Valid	107	100.0
	Excluded[a]	0	.0
	Total	107	100.0
a			

Reliability Statistics	
Cronbach's Alpha	N of Items
.867	16

Source: Primary Data Analysis.

Table-2: Demographic Details of the Respondents

Demographic Aspects	Details of the Respondents	
	No. of Respondents	Percentage (%)
Age	Below19	0	0
	19-20	29	25.7
	21-22	59	54.7
	Above22	19	19.6
	Total	107	100.0
Gender	Male	43	39.9
	Female	64	60.1
	Total	107	100.0
Branch of the student	CE	27	25.0
	CSE	41	38.9
	CAI	00	00
	ECE	14	13.0
	EEE	16	14.8
	Mechanical	9	8.3
	Total	107	100.0
Year of the study	1st year	00	00
	2nd year	0	0
	3rd year	47	44.4
	4th year	60	55.6
	Total	107	100.0

Table-3: Regression Analysis

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.768[a]	.591	.587	.31712
a. Predictors: (Constant), Technical training, Industry-specific training, Practical training				

Table-4: ANOVA

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	15.231	1	15.231	151.451	.000[b]
	Residual	10.559	105	.101		
	Total	25.790	106			
a. Dependent Variable: Job Opportunities						
b. Predictors: (Constant), Technical training, Industry-specific training, Practical training						

Source: Primary Data Analysis

INTERPRETATION:

The ANOVA table shows how well the regression equation fits the data. The model is statistically significant, $F(1,105) = 151.451$, $p < .001$, indicating that the independent variables collectively predict students' perception towards NPTEL- based electives. The model explained a substantial proportion of the variance in students' perception towards NPTEL –based electives ($R^2 = 15.231 / 25.790 = 0.591$, nearly 59.1%), suggesting

a strong relationship between the predictors and the dependent variable. The F-statistic (151.451) is high, and the significance level is less than 0.001, meaning the model is a good fit.

Table-5: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.839	.267		3.147	.002
IDVMEAN (Independent Variable Mean)	.811	.066	.768	12.307	.000

X.CONCLUSION

The study concludes that mandatory NPTEL electives play a significant role in enhancing engineering students' learning experience. Students generally have a positive perception toward NPTEL courses, particularly in terms of improving subject knowledge, independent learning ability, and exposure to industry-relevant content.

The statistical analysis confirms that learning value, course quality, certification value, institutional support, assessment systems, and learner effort significantly influence students' perception of NPTEL electives.

However, students also face challenges such as content complexity, workload pressure, and credit completion stress. With proper institutional support, effective guidance, and improved course management, NPTEL electives can serve as a powerful tool for enhancing academic learning, promoting self-directed learning, and preparing students for industry demands.

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