Journal of Contemporary Educational Research, 2026, Volume 10, Issue 1
http://ojs.bbwpublisher.com/index.php/JCER
ISSN Online: 2208-8474
ISSN Print: 2208-8466

A Study on the Development of an Aviation-Themed Course Series for Smart Building and Construction in the Context of New Engineering Education

Yunyang Zheng[1,2], Yanfen Zhong[1,2], Hao Li[1,2], Junhua Wu[1,2], Danting Luo[1,2], Xingyu Liu[1,2]*, Jingjing Guo[1,2]

[1]Department of Smart Building and Construction, School of Civil Engineering and Transportation, Nanchang Hangkong University, Nanchang 330063, Jiangxi, China
[2]Institute of Architecture and Urban-Rural Planning, Nanchang Hangkong University, Nanchang 330063, Jiangxi, China

***Corresponding author:** Xingyu Liu, 13312856359@163.com

Abstract: Aligning with national strategies for technological innovation and industrial upgrading. Focusing on innovating the aviation-oriented curriculum for this field, this initiative addresses the digital transformation needs of the aviation industry, exploring new pathways for integrating architectural education with aviation. By analyzing smart trends and talent demands in airport construction, "Architecture + Aviation Focus + AI" is proposed. Key courses like Airport Clearance Technology and Smart O&M Simulation are developed, alongside innovative teaching practices. This research offers theoretical and practical support for cultivating interdisciplinary talent, supporting high-quality development in the aviation industry chain.

Keywords: New Engineering; Smart buildings and construction; Architectural design; Aviation features; Curriculum construction

Online publication: February 4, 2026

1. Introduction

1.1. New Engineering requirements: Emerging demands for architectural education

Global engineering education is constantly updated to face unprecedented challenges and opportunities under the impact of the technological revolution and industrial transformation. The new engineering specialty is the upgrading and transformation of traditional engineering majors based on big data, cloud computing, artificial intelligence, virtual reality, and intelligent science and technology. It emphasizes the integration and innovation of technology with information and intelligence as the core, profoundly affecting the reform direction of higher engineering education [1]. "Smart Architecture and Construction" (082807T) is a new engineering major in architecture, approved by the Ministry of Education in 2019 as one of the 181 new undergraduate majors. Jiangxi Province has included it in 39 guiding majors for talent training to adapt to local economic and social

development.

As a key infrastructure field, the important path for the sustainable development of the construction industry in the future is to promote the deep integration of smart building design, smart construction technology, and smart city construction [2]. In the process of intelligent and green transformation of the construction industry, the Smart Building and Construction major shows strong development potential by integrating advanced technologies such as artificial intelligence, big data, and the Internet of Things. However, this also puts forward higher requirements for professional construction, including the construction of an interdisciplinary knowledge system, the strengthening of innovation ability, and the improvement of industry adaptability, so as to meet the urgent needs of compound talents in the future construction industry. This not only embodies the practical application of modern science and technology in construction engineering, but also represents the organic combination of the whole process from planning and design, construction implementation to operation and maintenance, technological innovation, and system integration. Smart Architecture and Construction belongs to the head major of the whole construction industry. The training of Smart Architecture and Construction professionals is an important measure to promote the rapid development of Jiangxi's economy and society.

1.2. Smart buildings and aviation industry: Convergence and emerging trends

The integration of smart building and aviation has emerged as a key trend in architecture. As civil aviation airports expand in construction, operation, and maintenance, the aviation industry's specialized demands for architecture and construction are increasingly prominent. The application of smart building technologies in airport design, construction, and operation not only enhances efficiency and quality but also underpins aviation safety and sustainable development [3]. To cultivate high-caliber talents adapted to this integrated trend, the Smart Building and Construction program must incorporate aviation characteristics and advance curriculum development and teaching reform. Per the *Civil Aviation Administration's Implementation Plan for Promoting Coordinated Development of Civil Aviation Intelligent Construction and Building Industrialization*, phased targets are specified: by late 2025, core design and construction enterprises in civil aviation should fully master digital design and intelligent construction technologies, with intelligent construction projects accounting for 50% of total investment.

Nanchang Hangkong University's Smart Architecture and Construction major was approved and enrolled in 2023, becoming the first in Jiangxi Province and the third in the country to open a school for this major. In 2023, 55 students were enrolled in the first batch of students in this major, increasing to 66 students in 2024. The 2023 edition of the Smart Building and Construction professional training program of Nanchang Hangkong University covers the theoretical and practical courses closely related to the aviation industry, which is used to reflect the curriculum construction with aviation characteristics.

1.3. Talent demand analysis for airport construction and operation in civil aviation

With the civil aviation industry's accelerating intelligent and green transformation and widespread adoption of new technologies, the demand for compound talents in airport construction and operation presents three key characteristics: First, an interdisciplinary knowledge system—encompassing professional fundamentals, technical skills, and soft skills—to realize in-depth integration of traditional architectural technology and digital tools, with professional knowledge as the core foundation [4]. Second, a green low-carbon orientation: amid the "double carbon" goal, talents must master green building materials application, intelligent energy control, and airport ecological restoration technologies to promote the full-lifecycle sustainable development of airports.

Third, full-chain collaborative competence: from planning and design, talents need to master civil aviation regulations, safety standards, and emergency management systems, and achieve integration of "construction, management, and maintenance" through digital tools.

2. Analysis of the current situation and problems of professional construction

In current architectural education, the integration of traditional courses (architectural design, structural mechanics, construction technology) and intelligent technologies remains inadequate—even Smart Building and Construction programs fail to update curricula timely, with cutting-edge tools (AI, big data, IoT, Digital Twin) only offered as electives or fragmented modules rather than systematically integrated [5]. Monotonous curriculum design and insufficient interdisciplinary integration hinder students' acquisition of compound skills; for example, "Public Building Design" still focuses on 2D drawing, lacking practical links like AI collaborative design, limiting students' grasp of smart building technologies, career competitiveness, and adaptability to industry digital transformation. Additionally, Chinese architecture curricula lack institution-specific modules: while research on Smart Building and Construction centers on professional development, talent training, and curriculum frameworks, the specialty's goal of cultivating interdisciplinary innovative new engineering talents for the construction industry's upgrading remains unmet. Against this backdrop, aviation-themed courses offer unique value: integrating aviation-specific knowledge and cases, they enable students to master key technologies in airport/aviation manufacturing plant design, broaden career pathways, and enhance program competitiveness, aligning with New Engineering requirements and supporting construction-aviation integration. Notably, civil aviation facilities feature complex functions, high technical integration, and stringent safety standards, yet traditional curricula provide scant aviation-specific content. Previously, only 1–2 superficial aviation-related electives existed, lacking AI integration—exacerbating the disconnect between talent training and aviation industrial chain needs, failing to meet demand for interdisciplinary talents in aviation infrastructure.

3. Innovating teaching implementation pathways

The main research content is shown in Figure 1.

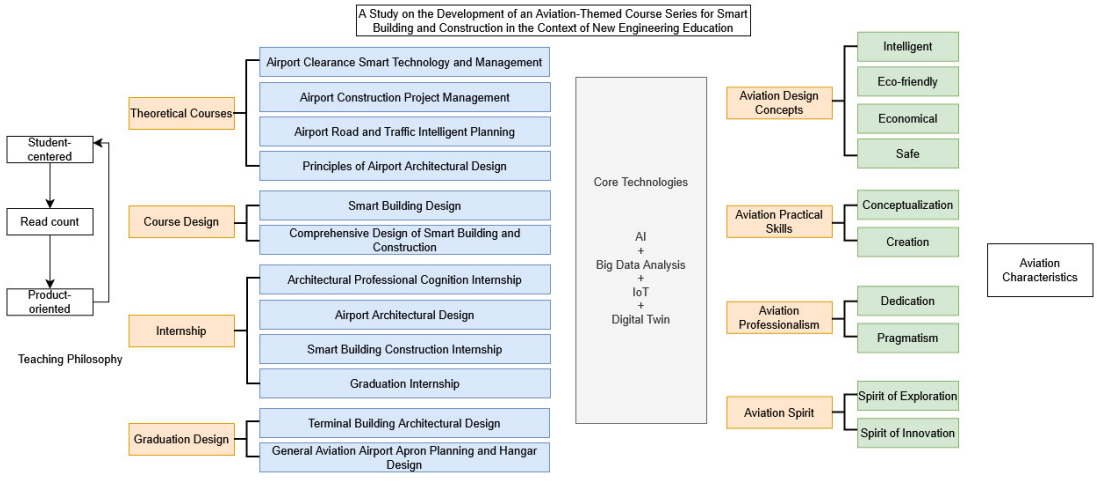

Figure 1. Main research content

Construct a curriculum system construction principle based on the OBE concept of new engineering, the three-dimensional intersection of "architecture + aviation characteristics + artificial intelligence" and the professional course of Smart Architecture and Construction. After the previous investigation and demonstration, the theoretical courses such as intelligent technology and management of airport clearance, airport construction project management, airport road and traffic intelligent planning, curriculum design such as intelligent building design, intelligent building and construction comprehensive design, architectural professional cognitive practice, intelligent building construction practice, graduation practice and graduation design in terminal building design, general aviation airport apron planning and hangar design were studied.

3.1. Enhancing awareness of professional aviation identity

Aviation-themed course content remains superficial, focusing merely on aviation-related design and construction, with insufficient emphasis on fostering students' aviation-specific awareness [6]. To address this, the study proposes two approaches:

(1) Clarify aviation's historical context and cultivate aviation sentiment by organizing diverse aviation history and culture activities, prompting students to re-examine the connection between professional knowledge and aviation culture, and fostering a sense of engagement.

(2) Interpret aviation spiritual connotations and shape values by studying the deeds of aviation industry pioneers relevant to the major, deepening students' grasp of aviation spirits, and establishing positive values. Additionally, integrating VR and BIM technologies into the aviation-themed Smart Building and Construction courses can substantially strengthen students' intuitive comprehension of aviation building and construction processes: VR enables students to simulate airport or aviation manufacturing plant design and construction, facilitating an intuitive grasp of building structures, equipment layouts, and intelligent system operation mechanisms; BIM provides lifecycle building data support, helping students master key technologies across design, construction, and operation phases.

3.2. Infusing aviation characteristics into the core curriculum

The study intends to solve this problem from the following two aspects:

(1) Condense aviation characteristics from the teaching content, teaching methods, and teaching means: using professional language to strengthen teaching, adding knowledge points and cases closely related to the aviation field in the course, so that students can deeply understand the current situation and development trend of the aviation industry. Experts, scholars, or practitioners in the aviation field are invited to teach or hold lectures to share their experiences and insights with students.

(2) Condensing aviation characteristics from the construction of teaching materials: updating the content of teaching materials with the forefront of aviation, ensuring that the content of teaching materials keeps up with the latest developments in the aviation industry, and incorporating the latest aviation theories, technologies, and practical cases into the teaching materials in a timely manner.

Taking the actual project as the carrier, organizing teaching activities through task decomposition and teamwork can effectively stimulate students' interest and initiative in learning. In the series of courses with aviation characteristics, architectural and construction projects with aviation characteristics can be selected as teaching-driven projects, such as airport reconstruction and expansion projects or aviation manufacturing plant intelligent upgrading projects. These projects usually involve knowledge in multiple disciplines and require students to have an interdisciplinary comprehensive ability. In the teaching process, the project task can be

decomposed into several sub-tasks and assigned to the student team to complete. In this way, students can not only deepen their understanding of the aviation construction and construction process, but also improve their communication ability and organizational coordination ability in teamwork.

4. Conclusion

From the New Engineering perspective, the aviation-themed curriculum system construction for the Smart Building and Construction major aims to address higher engineering education requirements amid technological revolution and industrial transformation, promote in-depth integration of architecture and the aviation industry, and support the cultivation of high-quality talents for smart civil aviation development. By integrating architecture, aviation characteristics, and intelligent technologies, this curriculum series compensates for traditional architectural courses' inadequacies in meeting aviation-specific needs, enhances students' professional competence and employment competitiveness, and provides talent support for aviation-focused architecture and construction sectors.

The main findings of this study are threefold: first, it clarifies the necessity of aviation-themed course series for the major; second, it proposes a comprehensive curriculum design covering basic, core professional, and practical courses, emphasizing the organic integration of aviation elements across all courses; third, it explores innovative teaching implementation paths to improve students' learning outcomes and practical abilities. These results offer valuable references for curriculum construction and teaching reform of related majors.

In the future, efforts should focus on deepening curriculum and teaching method reforms, strengthening university-enterprise cooperation, and optimizing resource allocation to comprehensively upgrade the aviation-themed curriculum quality. Priority will be given to the application of cutting-edge technologies in aviation architecture, while expanding university-enterprise collaborative practice platforms to align talent training with industrial development, thereby providing sustained impetus for smart airport construction and aviation industry upgrading—transporting more high-caliber talents with interdisciplinary expertise and innovation capacity for the aviation sector.

Funding

School-level teaching reform project of Nanchang Hangkong University in 2024: Research on the Construction of Aviation Characteristic Series Courses of "Smart Architecture and Construction" under the Background of New Engineering (JY24058)

Disclosure statement

The authors declare no conflict of interest.

References

[1] Sun C, Shao Y, Dong Y, et al., 2020, "Smart Building and Construction" Professional Teaching System Explores Architectural Education Thinking under the Concept of New Engineering. Times Architecture, (02): 10–13.

[2] Sun C, Han Y, Ren H, 2018, Research on Computational Design for Artificial Intelligence in Architecture. Architectural Journal, (09): 98–104.

[3] Zhong L, Chen Z, 2023, Research on the Teaching Reform of Intelligent Construction Specialty Based on the Perspective of New Engineering. Journal of Jilin Agricultural Science and Technology College, 32(03): 74–77.

[4] Han Y, Yao K, Sun C, 2025, Research on the Training Mode of Intelligent Architecture and Construction Talents of "Double-Drive Integration." World Architecture, (08): 35–39.

[5] Fan D, Jin B, Lei C, et al., 2023, Construction and Implementation Strategy of Civil Engineering Talents Training Mode under the New Professional Directory-Exploration and Practice of Hangzhou Vocational and Technical College of Science and Technology. China Vocational and Technical Education, (05): 74–80 + 91.

[6] Ding Y, 2023, Innovative Thinking and Practice of Intelligent Building Course under the Background of New Engineering. Higher Architectural Education, 32(03): 56–62.