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Architecture Education Under Seismic Challenge: A Critical Curriculum Analysis in Türkiye

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ABSTRACT
This study evaluates the position and quality of earthquake-resistant design in architecture undergraduate programs in Türkiye through a comparative analysis of the 2022 and 2025 course syllabi. The aim is to reveal the reflection of the February 6, 2023, Kahramanmaraş earthquakes on the curricula through quantitative and qualitative findings. Data compiled from YÖK Atlas and university course catalogs show no change in the number of compulsory courses, while a limited increase is observed in elective courses. Most of the course content remains engineering-based and theoretical, with a weak integration with architectural design studios and practical courses. To delve deeper into these findings, semi-structured interviews were conducted with nine experts who have research experience and teaching experience in this field. Common recommendations were obtained regarding the integration of earthquake knowledge into studio processes, increasing interdisciplinary collaborations, and the use of current pedagogical tools. Based on the findings, a curriculum consisting of 2 hours of theory and 2 hours of practice is proposed, including regulations, structural configuration, ground-structure interaction, and damage analysis, as well as a mandatory "Earthquake-Resistant Architectural Design" course. In conclusion, it is considered necessary and recommended to strengthen the number and quality of earthquake-focused content in architectural education, update it pedagogically, and integrate it into the core of design education.

Keywords: Architecture Curriculum, Architectural Education, Curriculum Analysis, Earthquake-Resistant Design, 2023 Kahramanmaraş Earthquake

1. INTRODUCTION

The destruction caused by earthquakes has repeatedly highlighted the vital importance of the architectural profession in ensuring structural safety. The design decisions made by architects in high-earthquake-risk areas directly determine the seismic performance of buildings. Past earthquakes have shown that incorrect architectural decisions, not adequately supported by engineering principles, lead to severe structural damage; this has been clearly demonstrated through detailed damage inspections conducted after earthquakes (Charleson, 1997).

Therefore, it is of great importance that the phenomenon of earthquakes is not overlooked in architectural education and that students have the necessary knowledge and awareness of earthquake-resistant design before graduation. Students who graduate without a sufficient understanding of the effects of seismic loads on structures and the design principles developed to counter these effects may fall short in ensuring

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structural safety during the application process. In this context, the theme of earthquake resistance should be addressed in architecture schools not just as a supplementary topic, but as a primary component of education (Morales-Beltran and Yıldız, 2020).
The literature on architectural education points to various shortcomings in imparting knowledge about earthquake resistance. For example, a comprehensive survey study of architecture schools in the United States revealed that earthquake engineering and design topics were not adequately integrated into the curriculum and that existing courses were unable to effectively teach this subject (Charleson, 2018). Similarly, recent academic reviews also report that earthquake-resistant design remains underrepresented in architecture programs. A recent systematic literature review revealed that earthquake design is not emphasized to the necessary extent, particularly in design studios, and that most educational research focuses on outcomes such as aesthetics and functionality rather than student performance (Arabacıoğlu et al., 2025). These findings indicate the need for greater emphasis on earthquake-resistant design in architectural education.

Numerous studies have demonstrated the necessity for architectural education to focus on this issue, particularly in regions with a high risk of earthquakes (Morales-Beltran, Charleson, and Aydın, 2020; Ayyıldız Potur and Metin, 2021; Charleson, 1997; Soyluk and Harmankaya, 2012). Critical parameters of architectural design from an earthquake safety perspective (e.g., regularity of building mass and stiffness distribution, appropriate selection of load-bearing systems, sufficient ductility, and detailing principles) should be instilled in architecture students early on. Indeed, a study indicates that architects working in earthquake-prone regions should treat earthquakes as a fundamental design criterion, just like functionality or aesthetics (Charleson, 2008).

Instilling the concept of earthquake-resistant design from the student years will prevent potential mistakes in future professional practice. As a leading scholar, Charleson (1997; 2005; 2008; 2012; 2018), known for his research on earthquakes in architectural education, has defined the minimum seismic design knowledge that architecture students should acquire before graduation:

- Structural elements should be analyzable, and suitable structural elements for design should be identifiable.
- They should be proficient in the sizing of load-bearing elements such as columns and beams in load-bearing systems like reinforced concrete, steel, and wood.
- Must gain the ability to understand and predict the load-bearing performance of structural materials (concrete, steel, etc.).
- Must be familiar with and able to use building forms in designs that can provide sufficient resistance to lateral loads such as gravity and earthquakes.
- Be able to predict the structural behavior of the ground during an earthquake and its potential effects on the building, and compare its impact on structural performance and architectural application.
- Should be able to understand the positive performance of regular structures against earthquake effects.
- Must know the interaction of load-bearing and non-load-bearing elements in the structure and their behavior under lateral loads.
- The structural elements and materials used in the design should be known to enhance the performance of the structure.

To summarize this information in general terms, it includes topics such as the responsibilities of architects regarding earthquake-resistant design, basic earthquake behavior, the earthquake performance of different structural systems, appropriate building form (regularity in plan and section, prevention of soft stories and torsion, etc.), structural-material details, and awareness of new earthquake technologies (e.g., seismic isolators).

Introducing students to these topics in various courses, including structure-focused ones such as building information/elements and application-focused ones like design studios, ensures they are equipped to collaborate effectively with engineers and make informed design decisions upon graduation (Charleson, 1997).

In the literature, various strategies have been proposed for integrating earthquake-resistant design principles into architectural curricula. For example, Morales-Beltrán and Yıldız (2020) emphasized that seismic design principles based on structural configuration can be conveyed to students using both qualitative and quantitative methods, and that studio-supported theoretical course models should be developed for this purpose. This study emphasizes the importance of course content that enables architecture students to internalize seismic design principles before commencing their design projects. In high-risk earthquake zones, the priority of this issue in education is also considered critical for social disaster preparedness. When examining international examples, it is noted that architects graduating from countries that effectively integrate earthquake and disaster topics into their curricula are more aware and prepared for disasters (Bodur, 2023). A study conducted by Özdoğan and Güney (2016) revealed that the inclusion of disaster topics in architecture programs in countries such as the USA, Japan, and Italy had a significantly positive impact on disaster preparedness and damage reduction. Indeed, the topic of "disaster" is addressed in Japanese architecture schools with comprehensive content that encompasses a wide variety of scenarios beyond earthquakes, including tsunamis, typhoons, and floods. Through such comprehensive training approaches, students are developing their professional competencies by learning the structural and design requirements of different types of disasters. Adopting a similar educational approach in countries like Türkiye, which have a high earthquake risk, is crucial for training architects who are better equipped to face disasters (Özdoğan and Güney, 2016).

International experiences demonstrate that seismic risk has led to substantial pedagogical reforms in architecture education in earthquake-prone regions (Charleson, 2018; Morales-Beltran, Charleson, and Aydın, 2020). In Japan, disaster risk reduction has been systematically embedded within educational frameworks, reinforcing structural awareness and preparedness across disciplines, including the built environment, and reflecting a broader culture of risk-conscious urbanism (Shaw, Sakurai, and Oikawa, 2021). Following major disasters in Italy, institutional approaches to disaster risk reduction and governance have increasingly emphasized interdisciplinary integration and knowledge transfer between planning, architecture, and engineering domains (Forino, von Meding, and Brewer, 2015). Similarly, in Iran, where seismic risk is persistent, architectural education has underscored the integration of structural engineering concepts into architectural thinking, strengthening professional responsibility and structural literacy within design education (Arefi and Hadian, 2013). These cases illustrate that high-risk geographies often translate seismic vulnerability into institutional and pedagogical reform. The Turkish context, therefore, provides a critical case to examine whether similar educational transformations have occurred after the 2023 earthquakes.

However, considering the current situation in Türkiye, it is challenging to assert that earthquake and disaster topics are widely and systematically incorporated into the curricula of architecture programs. For example, in a recent study, courses on earthquakes/disasters were surveyed across all architecture departments in Türkiye, and it was found that only 52 courses in total directly addressed this topic. Furthermore, it is stated that the content of most of these courses is engineering-focused (structural systems and basic principles of earthquake engineering), with limited coverage of the architectural design process. This table indicates that the current state of architectural education in a country with such a high earthquake hazard requires improvement (Dereci and Ertaş Beşir, 2023). In a study conducted by Akdağ and Beyhan (2024), the course catalogs of 102 architecture departments active in Türkiye as of 2022 were examined, and the total number of compulsory courses with the word "earthquake" or a related word in their name was determined to be 5, while the total number of elective courses was 39. In the same study, which found that earthquake-related courses in architecture schools are inadequate, the causes of earthquake damage are also classified into project-design errors, structural errors, and application and supervision errors. In this context, preventing faulty architectural design decisions, which are among the causes of earthquake damage, can only be achieved by providing aspiring architects with the necessary theoretical and practical knowledge about earthquakes during their education.

In light of the findings from the literature reviewed, it is clear that architecture students need to achieve an ideal level of knowledge and awareness regarding earthquake-resistant design by the time of graduation, both in terms of professional ethical responsibilities and reducing potential losses in disasters. Studies in the literature have highlighted the importance of integrating earthquake resistance into the architecture curriculum from different perspectives, and have developed suggestions to fill the educational gap in this area through methods such as studio-based learning, expert support, and the teaching of fundamental engineering principles. For example, Charleson (2018) emphasized that for effective earthquake education, students should first be provided with a minimum amount of theoretical content, followed by the application of this knowledge through studio projects. In this process, it is recommended to utilize interactive education with structural engineers, short-term intensive workshops, and simplified calculation software to prevent architecture students from having to solve complex structural problems independently.

The devastating earthquakes that have occurred in Türkiye in recent years have once again underscored the need for all stakeholders to collaborate in building earthquake-resistant structures and cities, as well as the vital importance of every step taken in earthquake preparedness. The two earthquakes, measuring 7.8 and 7.5 magnitude and centered in Kahramanmaraş on February 6, 2023, are recorded as one of the most dramatic disasters in the country's history. As a result of the earthquakes, more than 48,000 people lost their lives in 11 provinces along the East Anatolian Fault Line, over half a million buildings were destroyed or severely damaged, significant financial losses occurred, and hundreds of thousands of structures became unusable (Republic of Türkiye Strategy and Budget Directorate, Kahramanmaraş and Hatay Earthquakes Report, 2023). While science, technology, and construction techniques have advanced significantly in our current era, the fact that such losses still occur in earthquakes underscores the urgent need for immediate, concrete, and solution-oriented steps to be taken. This recent negative situation clearly demonstrates that even the most minor improvement in earthquake preparedness is vitally important.

In this process, particularly in regions with high earthquake risk, acquiring knowledge and skills related to earthquake safety in architectural education has become a necessity rather than a choice. This situation is even more vital in Türkiye, where almost all of its land is at risk of earthquakes (Figure 1).

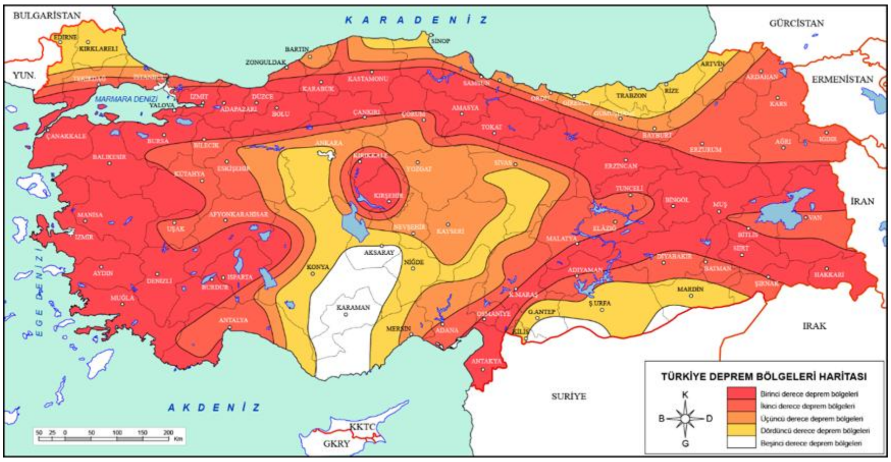

Figure 1. Seismic Hazard Map of Türkiye (AFAD, 2019)

This study aims to critically evaluate the place and nature of earthquake-resistant design in the curricula of architecture schools in Türkiye, particularly the reflections of the February 6, 2023, earthquakes on architecture school education programs. In this way, the devastating impact of the Kahramanmaraş earthquake on the country, particularly on architectural education, will be revealed, and the earthquake's ideal position in architectural education will be determined within the current framework, leading to the development of recommendations. In this context, this research is structured around the question: "What is the current status of earthquake-resistant design in the curricula of architecture schools in Türkiye, and what changes have occurred in these curricula after the 2023 Kahramanmaraş earthquakes?"

This study presents the first nationwide post-2023 analysis of earthquake-related content within architecture curricula in Türkiye. Unlike previous studies that focused primarily on structural engineering education or individual institutional case analyses, this research systematically maps all active architecture undergraduate programs listed in YÖK Atlas through title-based curriculum filtering and combines this quantitative assessment with expert interviews. By doing so, it not only documents the current state of seismic design education but also critically evaluates institutional inertia following the 2023 Kahramanmaraş earthquakes. Furthermore, the study proposes a structured, compulsory course model, thereby moving beyond critique toward actionable curricular reform.

2. METHOD

The research method consists of three stages. In this study, in addition to the information in the relevant literature, the emphasis given to earthquake and earthquake-resistant design in architecture undergraduate programs in Türkiye was examined by comparing the curricula of 2022 and 2025 (after the 2023 Kahramanmaraş earthquake). Subsequently, expert opinions were sought to answer the question "what information and to what extent should architecture students master regarding earthquake-resistant design," and semi-structured interviews were conducted with nine different experts who have research or teach in this field to explore answers to the aforementioned question. In the final stage of the method, the semester-by-semester topic distributions of earthquake-related courses in schools that currently have mandatory earthquake-related courses were examined in detail. An "Earthquake-Resistant Architectural Design" course was then developed based on these topic distributions, the examined curriculum, and expert opinions. The study pattern is based on a comparative case analysis, literature review, and expert opinions, utilizing both qualitative and quantitative approaches.

In the first stage, the 2022 course plans of architecture schools in Türkiye were systematically compared with their 2025 course plans. The research universe consists of all architecture undergraduate programs at public and private universities registered in the Higher Education Council (YÖK) Atlas database. In this context, the course catalogs of the architecture departments of 102 universities were examined in 2022 and 105 universities in 2025. The YÖK Atlas system, official course catalogs, and course information package data from universities were used as data collection tools. First, the course plans and content implemented in each architecture program during the 2022–2023 academic year were recorded. Then, in May 2025, the current curricula of the same programs were examined (during this process, two new architecture programs began offering education, and one program closed).

When examining courses in architecture programs, the presence of words such as "Earthquake," "Seismic," "Seismology," and "Seismicity" in course titles was investigated, and elective or compulsory courses containing these expressions were included in the systematic evaluation. A title-based filtering strategy was employed to identify earthquake-related courses within architecture curricula explicitly. This approach was selected to ensure methodological transparency and replicability across all institutions. While such filtering may not capture implicit or partially embedded seismic content within broader studio or structural courses, it enables an objective evaluation of explicit curricular prioritization. The study deliberately focuses on visible and formally recognized course titles to assess institutional commitment at the policy level rather than informal or instructor-dependent integrations. However, the course content and weekly topic distribution of courses related to the subject (especially those in architecture programs, such as structural systems, building elements, and physical environmental control) were examined in detail, and it was found that some of these courses included information related to earthquakes for one or more weeks during the semester. This type of course, which partially and for a limited time covers the topic of earthquakes, has been excluded from evaluation.

In the second phase of the method, interview requests were sent to 24 academics with expertise in earthquake-resistant design or who were currently teaching these subjects. However, responses were received from only nine academics, and semi-structured interviews were conducted with some of these nine individuals online and with others face-to-face to gather their opinions on earthquake-resistant design in architectural education. The discussions generally focused on the position of the earthquake issue in architectural education, the topics that should be covered in courses, and pedagogical approaches. Interview data were analyzed using thematic coding. Recurring conceptual clusters were identified, including interdisciplinarity, studio integration, regulatory awareness, professional responsibility, and pedagogical reform. Responses were grouped and synthesized to detect convergent expert perspectives rather than to quantify frequency.

In the third stage, a proposal for a mandatory "Earthquake-Resistant Architectural Design" course for architecture schools in Türkiye was developed based on literature reviews and interviews with experts. When developing the subject content and distribution of this course, the weekly topic distributions of earthquake-focused courses that are already mandatory in the curricula were analyzed, and the findings were critically interpreted with reference to literature information and expert opinions to determine the subject content and distribution of the suggested course. The research flowchart is shown in Figure 2.

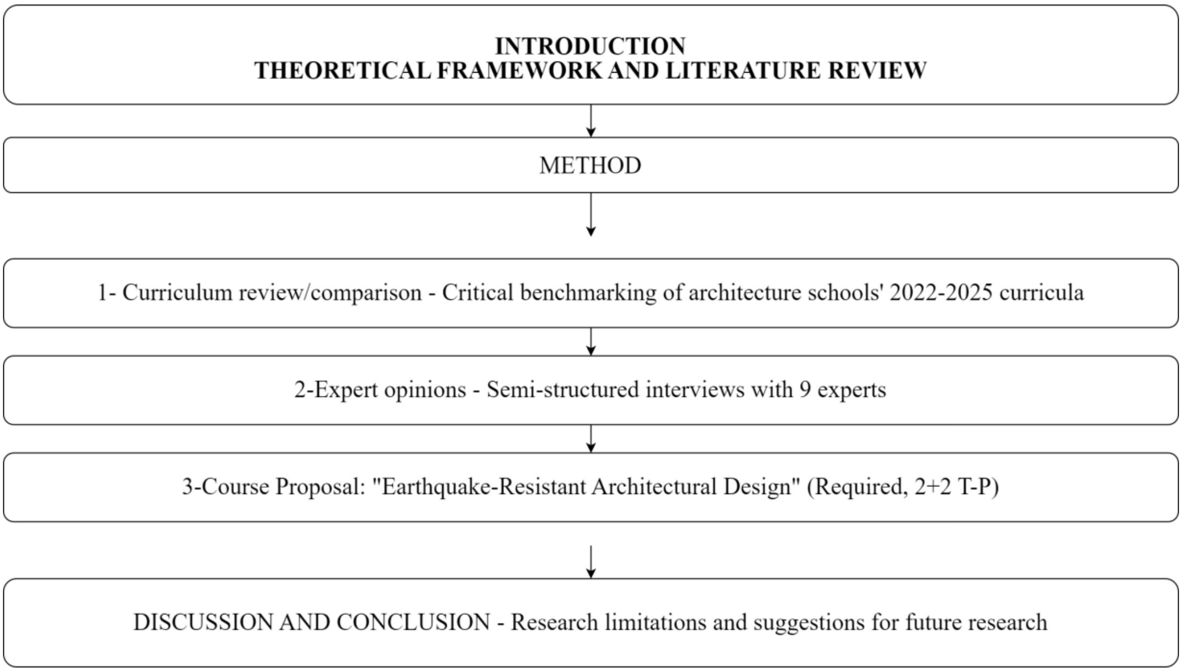

Figure 2. Research Flowchart

It is acknowledged that earthquake-related themes may occasionally appear within architectural design studios or structural systems courses without being reflected in course titles. However, this research evaluates formal curricular positioning rather than episodic or instructor-driven inclusions. Therefore, the absence of explicit course titles should not be interpreted as total pedagogical absence but rather as limited institutional formalization.

All expert interviews were conducted on a voluntary basis. No personal or sensitive data were collected. Ethical approval was deemed not required in accordance with institutional guidelines.

3. FINDINGS

This section presents the comparative findings of the 2022 and 2025 architecture curricula in Türkiye with a specific focus on earthquake-related courses. The results are followed by a synthesis of expert interview findings and an outline of the proposed mandatory “Earthquake-Resistant Architectural Design” course developed in response to the identified gaps.

First, the curricula of architecture schools in 2022 and 2025 were compared (Table 1). In light of these findings, it was questioned whether the February 2023 Kahramanmaraş earthquakes made a difference in the place of earthquakes in architectural education.

Table 1. The Status of Earthquake-Related Courses in Schools of Architecture in Türkiye (2022–2025)

Institution	2022 (M: / E:)	2025 (M: / E:)
Artvin Çoruh Ü.	M: –; E: Earthquake-Resistant Building Design	The department is closed.
Balıkesir Ü.	M: –; E: Earthquake-Resistant Building Design	M: –; E: –
Bolu Abant İzzet Baysal Ü.	M: –; E: Principles of Earthquake-Resistant Building Design	M: –; E: –
Burdur Mehmet Akif Ersoy Ü.	M: –; E: The Earthquake Factor in Architectural Design	M: –; E: The Earthquake Factor in Architectural Design
Bursa Uludağ Ü.	M: –; E: Earthquake Factor in Architectural Design	M: –; E: 1) Earthquake-Safe Architectural Design; 2) Earthquake-Resistant Building Design
Çankaya Ü.	M: –; E: Earthquake Architecture	M: –; E: Earthquake Architecture
Çukurova Ü.	M: –; E: Earthquake-Resistant Building Design	M: –; E: Earthquake-Resistant Building Design
Dokuz Eylül Ü.	M: –; E: Architectural Design Principles for Earthquake-Resistant Structures	M: –; E: Architectural Design Principles for Earthquake-Resistant Structures
Düzce Ü.	M: –; E: Seismic Factor in Design	M: –; E: Earthquake Factor in Design; Earthquake Regulations and Their Effects on Architectural Design
Fırat Ü.	M: –; E: Disaster Awareness	M: –; E: –
Gazi Ü.	M: Earthquake-Resistant Architectural Design; E: Earthquake Regulations and Their Impact on Architectural Design	M: Earthquake-Resistant Architectural Design; E: –
Gebze Teknik Ü.	M: Principles of Earthquake-Resistant Building Design; E: –	M: Principles of Earthquake-Resistant Building Design; E: –
Harran Ü.	M: Earthquake-Resistant Building Design; E: –	M: Earthquake-Resistant Building Design; E: –
Hatay Mustafa Kemal Ü.	M: –; E: Fire and Disaster Safety in Buildings	M: –; E: –
Haliç Ü.	M: –; E: Design Principles of Structures Against Earthquakes	M: –; E: –
Işık Ü.	M: –; E: Design Principles of Structures Against Earthquakes	M: –; E: –
İstanbul Gelişim Ü.	M: –; E: Disasters and Settlements	M: –; E: Earthquake-Resistant Building Design; Earthquake Awareness
İstanbul Kültür Ü.	M: –; E: Earthquake-Resistant Building Design; Disaster and Housing Design	M: –; E: –
İstanbul Okan Ü.	M: –; E: Earthquake-Resistant Architectural Design	M: –; E: Earthquake-Resistant Architectural Design
İstanbul Teknik Ü.	M: –; E: Earthquake-Resistant Building Design	M: –; E: –
İstinye Ü.	M: –; E: Earthquake-Resistant Building Design	M: –; E: –
İzmir Ekonomi Ü.	M: –; E: Disaster-Resistant Building Design	M: –; E: Disaster-Resistant Building Design
İzmir Yüksek Teknoloji Enstitüsü	M: –; E: Earthquake and Structural Behavior; Earthquake-Resistant Structural Design	M: Seismic Behavior of Structures and Earthquake-Resistant Design; E: Earthquake and Structural Behavior; Earthquake-Resistant Structural Design
Karabük Ü.	M: Architectural Design Principles in the context of Earthquakes; E:–	M: Architectural Design Principles in the context of Earthquakes; E:–
Karadeniz Teknik Ü.	M: –; E: Earthquake-Resistant Building Design	M: –; E: Earthquake-Resistant Building Design
Kırklareli Ü.	M: –; E: Earthquake and Housing	M: –; E: Earthquake-Resistant Building Design
Konya Teknik Ü.	M: –; E: Seismic Behavior of Building Systems	M: –; E: Seismic Behavior of Building Systems
KTO Karatay Ü.	M: Earthquake-Resistant Building Design; E: –	M: –; E: –
Manisa C. Bayar Ü.	M: –; E: Earthquake-Resistant Building Design	M: –; E: Earthquake-Resistant Architectural Design
Mimar Sinan G.S.Ü.	M: –; E: Earthquake-Resistant Building Design	M: –; E: Earthquake-Resistant Building Design
Necmettin Erbakan Ü.	M: –; E: Temporary Disaster Housing Design	M: –; E: Earthquake and Architecture: Temporary Disaster Housing Design
Ondokuz Mayıs Ü.	M: –; E: Earthquake-Resistant Building Design	M: –; E: Earthquake-Resistant Building Design
Pamukkale Ü.	M: –; E: Disaster Planning	M: –; E: Earthquake-Resistant Structure Design (Outside the department)
Sakarya Ü.	M: –; E: Earthquake and Architecture	M: –; E: Earthquake and Architecture; Living with Earthquakes
Sivas Cumhuriyet Ü.	M: –; E: Earthquake-Resistant Building Design	M: –; E: –
Trakya Ü.	M: –; E: Earthquake-Resistant Building Production	M: –; E: Earthquake-Resistant Building Production
Van Yüzüncü Yıl Ü.	M: –; E: Disaster and Architecture; Earthquake-Resistant Building Design	M: –; E: Earthquake-Resistant Building Design
Yıldız Teknik Ü.	M: –; E: Seismic Factor in Design	M: –; E: Seismic Factor in Design; Earthquake and Planning
Newly Added Courses (After 2022)		
Alanya Alaaddin Keykubat Ü.	M: –; E: –	M: –; E: Seismic Factor in Design
Atatürk Ü.	M: –; E: –	M: –; E: Earthquake-Resistant Building Design
Başkent Ü.	M: –; E: –	M: –; E: Earthquake Safety and Design in Buildings
Doğuş Ü.	M: –; E: –	M: –; E: Earthquake-Resistant Construction Systems
Fatih Sultan Mehmet V.Ü.	M: –; E: –	M: –; E: Earthquake Factor in Architecture
Hasan Kalyoncu Ü.	M: –; E: –	M: –; E: Earthquake-Resistant Building Design
Maltepe Ü.	M: –; E: –	M: –; E: Earthquake-Safe Architectural Design
Niğde Ömer Halisdemir Ü.	M: –; E: –	M: –; E: Earthquake Factor in Architectural Design

Recep Tayyip Erdoğan Ü.	M: –; E: –	M: –; E: Introduction to Earthquake-Resistant Building Design
Tekirdağ Namık Kemal Ü.	M: –; E: –	M: –; E: Earthquake-Resistant Building Design
Toros Ü.	M: –; E: –	M: –; E: Earthquake-Resistant Design
Yaşar Ü.	M: –; E: –	M: –; E: Earthquake-Resistant Structures
Total:	**2022: 5 Mandatory; 39 Elective**	**2025: 5 Mandatory; 41 Elective**

Source: YÖK Atlas data and online course information packages/catalogs from schools. M: Mandatory, E: Elective

The comparative analysis of earthquake-related courses between 2022 and 2025 reveals that no significant curriculum change was observed after 2023. The overall number and status of compulsory and elective courses remained largely stable, with only minor shifts in course categorization across institutions. While a limited number of universities introduced or removed individual courses, these changes did not alter the broader national picture.

Several institutions modified the status of existing courses from compulsory to elective or vice versa; however, such adjustments appear isolated rather than systemic. In some cases, newly introduced compulsory courses were counterbalanced by removals in other institutions. Overall, the findings indicate institutional inertia in translating the impact of the February 2023 Kahramanmaraş earthquakes into structured curricular reform.

The absence of compulsory seismic design courses in major metropolitan contexts, particularly in İstanbul, where seismic vulnerability is widely acknowledged, further highlights the limited institutional response. Geographic location did not produce a consistent pattern in curriculum structuring, suggesting that earthquake risk awareness has not yet become a determining factor in formal architectural education policy.

Although curriculum transformation cannot be attributed solely to disaster events, major earthquakes represent a critical societal trigger that can reshape educational priorities. Architectural education must evolve in response to social, environmental, and technological transformations. Contemporary curriculum design increasingly incorporates interdisciplinary collaboration, applied learning, and community-oriented perspectives (Özmen, 2013; Aktuna and Köylüoğlu, 2024). However, the findings suggest that recent earthquakes have not substantially influenced the formal curricular structure of architecture programs in Türkiye.

The number of architecture departments in Türkiye has increased in recent years, yet this quantitative expansion has not been accompanied by proportional curricular revision in relation to seismic risk (Figure 3). Newly established programs similarly do not demonstrate a systematic integration of earthquake-focused architectural education.

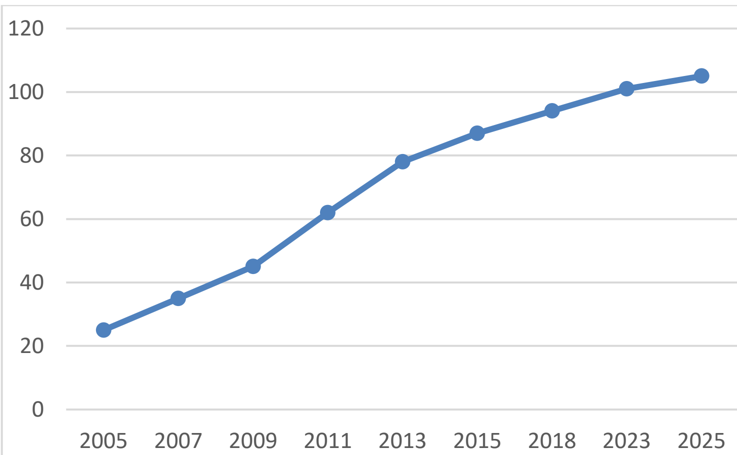

Figure 3. Annual Growth of Architecture Schools in Türkiye

Following the curriculum reviews, the second phase of the research methodology involves gathering expert opinions. In this context, interviews were conducted with nine different experts who have research about earthquake-resistant design or provide training on this topic within their own institutions. Opinions were gathered on issues such as the extent to which earthquake-resistant design should be incorporated into architectural education, the fundamental content students should be familiar with on the topic, and the training strategies related to earthquake-resistant design in architectural education. The key findings that emerged from expert opinions are as follows:

- Earthquake-resistant design in architectural education should be addressed through a combination of theory and practice within a mandatory course specifically opened for this topic, and should also be considered as a design problem/parameter in practical courses such as design studios, structural design, and building elements.
- Joint studies and practices should be carried out with support from related disciplines when necessary, and the necessity of addressing this issue not only as an architectural problem, but with a multi-actor and interdisciplinary integrated approach.
- Emphasizing the misconception that the issue is seen only as an engineering problem and conveying the awareness that each discipline has responsibilities regarding the production of earthquake-resistant structures.
- Adopting legal regulations and directives related to the issue as inputs that directly affect the architectural design process.
- Expressing that merely conveying the issue theoretically is insufficient and that knowledge should be reinforced and made permanent through learning-by-doing-focused practice.
- Stating that the effects of earthquakes are not limited to the superstructure level, and that foundations and the ground on which the structure is built are also important in this regard.
- Emphasizing the importance of construction materials and systems in terms of earthquake performance and highlighting advantageous and disadvantageous situations horizontally and vertically.
- Evaluating the pedagogical dimension of the issue and developing education strategies, comprehensively assessing the cognitive characteristics of today's student profile in particular, and evaluating education models that align with their changing learning expectations and habits.
- In an educational model where theoretical transfers are supported by application, the evaluation of alternative reality environments (augmented reality, virtual reality, etc.), which hold significant potential for architectural education, especially today, along with 3D and 4D printing technologies, tools like artificial intelligence, and educational models such as gamification and game-based learning.

When evaluating the findings obtained from expert opinions, a common emphasis emerges: the subject of earthquakes in architectural education should be presented not only through theoretical transmission but also through an integrated approach of theory and practice within a mandatory course. In this regard, the necessity of practical pedagogical approaches supported by interdisciplinary collaboration and the active participation of engineering and other relevant fields is noteworthy. Another point that experts particularly emphasize is the need to align current educational approaches more closely with the student profile and to utilize innovative educational tools and approaches in this process. Additionally, the experts' common recommendations include the need to convey elements such as the structure-soil relationship, the performance of construction materials, and the direct impact of regulations on the architectural design process to students. These findings make it imperative to incorporate earthquake-focused courses into architectural education, restructure the content of existing courses, and support them with current pedagogical approaches.

Based on the literature review and expert synthesis, a mandatory 14-week (2T+2P) course titled “Earthquake-Resistant Architectural Design” was developed. Existing mandatory earthquake-related courses were critically reviewed (Table 2), revealing significant variation in topic sequencing, emphasis, and pedagogical depth across institutions.

When examining the content of mandatory earthquake-related courses, it becomes evident that there is no consensus among institutions regarding topic sequencing, distribution, or curricular positioning. While some thematic overlaps exist, approaches vary considerably across schools. Based on the data presented in Table 2, these courses generally concentrate on fundamental earthquake engineering principles, regulatory frameworks, structural typologies, and soil–structure interaction.

However, the content structure appears largely unchanged in recent years, and recent national earthquake experiences have not substantially reshaped course organization. Notably, explicit discussion of the architect's role and responsibilities within the integrated disaster management stages defined by AFAD (2022) (including risk reduction, preparedness, response, and recovery) is absent. Furthermore, the exclusively theoretical format and limited weekly contact hours constrain the development of applied competencies in earthquake-resistant design. In response to these limitations, the proposed "Earthquake-Resistant Architectural Design" course is structured as a 2-hour theoretical and 2-hour practical module per week.

Table 2. Curriculum Breakdown of Five Mandatory Earthquake-Related Courses and the Proposed 'Earthquake-Resistant Architectural Design' Course in Architecture Schools

Institutions	**1- Gazi Ü. Earthquake-Resistant Architectural Design**	**2- GEBZE T. Ü. Principles of Earthquake-Resistant Building Design**	**3-HARRAN Ü. Earthquake-Resistant Building Design**	**4- KTÜN Earthquake Behaviors in Construction Systems**	**5- KARABÜK Ü. Architectural Design Principles in the Context of Earthquakes**	**Proposed Course: Earthquake-Resistant Architectural Design**
Semester	VII	V	VII	VI	VII	VII
Credit (t+u)	2+0 CREDIT	2+0 CREDIT	2+0 CREDIT	2+0 CREDIT	2+0 CREDIT	2+2 CREDIT
Week1	Earthquakes and earthquake engineering, characteristics of earthquake ground motions	Earthquakes and Tremors	Earthquakes and earthquake engineering, characteristics of earthquake ground motions	Explanation of topics and course plan, determining students' expectations for the course	Determining earthquake and earthquake engineering/assignment topics	Natural Disasters and Earthquakes
Week 2	Scientific and social problems in predicting earthquakes and issuing warnings.	Basic concepts related to Earthquake Engineering and seismic risk	Scientific and social problems in predicting earthquakes and issuing warnings.	General information about Building Systems and Regulations	Reaction theorem	Earthquakes and basic concepts related to earthquakes
Week3	Earthquake regulations	Dynamic Properties of Structures	Earthquake regulations	General concepts related to earthquakes	Characteristics of Earth movements	Fault types and characteristics
Week4	The effect of earthquake forces on the structure, earthquake regulations	Behavior and Design Spectrums	The effect of earthquake forces on the structure, earthquake regulations	Seismicity and damage	The effect of earthquake forces on structures/presentation	Earthquake waves and their characteristics
Week5	Earthquake-resistant architectural design	Earthquake Specifications and Capacity Design Principles - Project	Earthquake-resistant architectural design	Earthquake Damage in Masonry Structures	Scientific and social problems/presentation regarding earthquake prediction and public warning	Effects of earthquake forces on structures
Week6	1. Midterm Exam	Geotechnical Earthquake Engineering (Soil Behavior)	1. Midterm Exam	Measures to be taken for earthquake-resistant building design in masonry structures	Turkish Earthquake Code and Design Assumptions/Presentation according to the Earthquake Code	Soil-Structure Interaction in Earthquakes
Week7	Lateral load-bearing systems, frames	Geotechnical Earthquake Engineering	Lateral load-bearing systems, frames	Determining Homework Topics, General Explanations Regarding the Topics	Safe earthquake behavior/presentation	Midterm Exam

Week8	Curtains, perforated curtains, frame curtain support elements	Earthquakes in Architectural Design	Curtains, perforated curtains, frame curtain support elements	Midterm Exam	Cutting error/presentation on curtain walls	Earthquake-resistant architectural design - basic principles - 1
Week9	Tube frames, cores, hybrid systems	Midterm Exam	Tube frames, cores, hybrid systems	Earthquake Damage in Frame Structures	Tube systems/presentation	Earthquake-resistant architectural design - basic principles - 2
Week10	Points to consider when installing curtain wall systems	Earthquake in Architectural Design (Vertical Configuration Irregularities)	Points to consider when installing curtain wall systems	Measures to be taken for earthquake-resistant building design in frame structures	Curtain-frame (mixed) systems/presentation	Earthquake damage
Week11	2nd Midterm Exam	Earthquakes in Architectural Design (Non-Structural Elements)	Necessary considerations for the harmony between the building's column-beam frame and foundation-soil relationship.	Student Group Presentation - Conveying and Evaluating Topics through Visual Expression Methods	Computer modeling/presentation of curtain-wall (composite) systems	Legal regulations and directives related to earthquakes
Week12	Necessary considerations for the harmony between the column-beam frame of structures and the foundation-soil relationship.	Anti-Seismic Devices (Seismic Isolation and Energy Dissipation Devices)	Prefabricated structures	Student Group Presentation - Conveying and Evaluating Topics through Visual Expression Methods	Considerations/Presentation when stairs and staircases are the main support	Earthquake Mitigation Strategies - Integrated Disaster Management System
Week13	Prefabricated structures	Introduction to Performance-Based Design	Ground and earthquake damage	Student Group Presentation - Conveying and Evaluating Topics through Visual Expression Methods	Ground-damage relationship/presentation	Prefabricated buildings
Week14	Ground and earthquake damage	Computer Applications	Ground and earthquake damage	Student Group Presentation - Conveying and Evaluating Topics through Visual Expression Methods	Earthquake damage/presentation	The social role of the architect in earthquake processes

Note 1. While the table includes schools with mandatory earthquake-related courses in their curriculum, the content of the course "Earthquake Behavior of Structures and Earthquake-Resistant Design" offered at IYTE was not included in the course information package and catalog program. Therefore, the course "Principles of Architectural Design According to Earthquakes," which is mandatory in the 2022 curriculum and elective in the 2025 curriculum at the Department of Architecture, Karabük University, was included instead. Note 2. Although the content of the courses at Gazi University and Harran University is the same, they are taught by different instructors.

4. CONCLUSION AND RECOMMENDATION

Within the scope of this study, the institutional positioning of earthquake-resistant design in architecture education in Türkiye was critically examined through curriculum comparison and expert perspectives. The findings collectively indicate a persistent misalignment between the country's seismic reality and its formal architectural education framework. While minor curricular adjustments were observed, they do not constitute a systemic transformation in response to the 2023 Kahramanmaraş earthquakes.

The findings reveal a structural gap between seismic risk reality and curricular institutionalization in Turkish architecture education. Despite the scale and impact of the 2023 earthquakes, explicit and compulsory earthquake-focused architectural courses remain limited. This suggests that disaster events alone do not automatically trigger educational reform. Instead, systemic curriculum restructuring requires coordinated institutional, regulatory, and pedagogical commitment.

The study further demonstrates that existing earthquake-related courses tend to remain predominantly theoretical and structurally oriented, with limited integration into the architectural design process. However, seismic resilience in architecture cannot be treated merely as technical compliance or engineering calculation; it must be internalized as a core design responsibility shaping spatial decisions, material strategies, and professional accountability.

From a policy perspective, strengthening architectural education in high-risk geographies requires the formal institutionalization of seismic literacy within curricula. This includes positioning earthquake-resistant design not as an elective specialization but as a fundamental component of architectural competence. Educational authorities, universities, and professional bodies should collaborate to ensure that disaster resilience becomes structurally embedded within architectural training.

The proposed compulsory, studio-integrated seismic design module offers a structured framework to embed disaster resilience within architectural pedagogy. By positioning seismic awareness not merely as technical compliance but as a core design responsibility, architecture education can move from reactive acknowledgment toward proactive resilience formation.

Among the significant limitations of this study are that evaluations were based primarily on formal curriculum documents, course implementation processes were not examined in depth, and expert interviews were conducted with a limited number of academics. Furthermore, the analysis was restricted to the 2022–2025 period in order to evaluate the immediate post-earthquake context. Future longitudinal and field-based studies would provide a more comprehensive understanding of structural transformation processes in architectural education.

In this context, future research and policy directions may focus on:
• Developing systematic strategies for integrating earthquake-related content into studio-based and applied architectural courses.
• Measuring students' knowledge acquisition and design competencies related to seismic resilience.
• Expanding the effective use of contemporary educational technologies (AI-supported tools, augmented and virtual reality applications, simulation environments) within earthquake education.
• Designing and evaluating interdisciplinary workshop models involving architects and engineers.
• Increasing the number and institutional status of earthquake-focused courses, particularly at the compulsory level.
• Ensuring that seismic design is addressed continuously from the early stages of architectural education rather than as a fragmented or late-stage addition.
• Embedding disaster management frameworks, including integrated disaster management systems, into architectural curricula while clarifying the architect's professional role within these processes.

Transforming architectural education in Türkiye in response to seismic reality is not solely an academic reform issue but a societal necessity. Achieving meaningful transformation will require coordinated strategic action among policymakers, academic institutions, and professional organizations to embed resilience as a central pillar of architectural formation.

Ethical Statement
The authors declare that academic and ethical standards were strictly followed throughout all stages of this study, and all utilized sources have been appropriately cited.

Ethical Approval
The authors declare that this study does not require ethics committee approval. All expert interviews conducted within the scope of the study were carried out on a voluntary basis, and no personal or sensitive data were collected.

Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Author Contributions

1st Author: Conceptualization, Literature Review, Methodology, Data Collection, Analysis, Visualization, Writing (Original Draft).
2nd Author: Supervision, Conceptualization, Methodology, Validation, Interpretation of Analyses, Writing (Review and Editing), Academic Content Development.

AI Declaration

The authors declare that, during the preparation of this study, they used the artificial intelligence-based language tools Grammarly and QuillBot solely for the purposes of grammar checking and English translation. All outputs produced by these tools were carefully reviewed by the authors in terms of scientific accuracy, content integrity, and ethical principles. The final manuscript was completed entirely under the scientific responsibility of the authors.

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