جامعة عبد المالك السعدي
Université Abdelmalek Essaadi

**Pole for Doctoral Studies**
**Center for Doctoral Studies Sciences and Techniques and Medical Sciences**

# ANNOUNCEMENT OF DOCTORAL THESIS DEFENSE

Centre des Etudes Doctorales Sciences et Techniques et Sciences Médicales

## Ms. EL HANKOURI Yousra

**Will present their research work with the aim of earning a Doctorate**

**Doctoral program: Sciences and Technique Engineering**
**Discipline: Civil Engineering**
**Specialty: Civil Engineering, Mechanics and Materials**

**On 09/07/2026 at 10H00 at the "B" Lecture Hall, National School of Applied Sciences of Al-Hoceima, UAE**
**Under the Theme**

**Contribution to the analysis of the dynamic and seismic behavior of structures made of reinforced concrete, composite materials, and rammed earth**

**Front of the jury composed of:**

| First Name & Last Name | Establishment | Designation |
|---|---|---|
| Pr. ADDAM Mohamed | ENSA of Al Hoceima, UAE | President |
| Pr. RAHMOUNE Miloud | EST of Meknès, UMI | Reviewer |
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| Pr. MEZIANE Mohamed | FST of Mohammedia, UH2 | Examiner |
| Pr. EL GHOULBZOURI Abdelouafi | ENSA of Al Hoceima, UAE | Supervisor |

***Host Research Structure:*** Applied Sciences Laboratory (LSA), Team of Environmental Management and Civil Engineering (GEGC)

# Abstract

This thesis is part of the field of structural dynamics and earthquake engineering. It focuses on the study of the dynamic and seismic behavior of structural systems subjected to different types of loading, particularly harmonic and seismic excitations. Through the use of analytical methods and numerical time-integration techniques, this work aims to accurately analyze the structural response and to highlight phenomena such as resonance, nonlinear behavior, stiffness degradation, and progressive material damage under dynamic loading. Particular attention is given to the influence of key mechanical and dynamic parameters, such as mass, stiffness, damping, the nature of the excitation, and loading intensity, on the overall structural response. The research also addresses the improvement of structural dynamic and seismic performance through the use of strengthening techniques and energy dissipation devices.

To achieve the set objectives, this thesis is structured around three main studies. First, the dynamic and seismic behavior of structures subjected to harmonic and seismic excitations is analyzed using time-integration methods, notably the Newmark-$\beta$ and Wilson-$\theta$ algorithms. Second, the contribution of fiber-reinforced concrete to structural strengthening is investigated due to its enhanced mechanical properties in terms of strength, ductility, and energy dissipation, with the structural response being evaluated using the Runge–Kutta method.

Finally, this approach is extended to earthen structures, particularly rammed earth (RE) constructions, in order to assess the effectiveness of a vibration mitigation strategy based on the combined use of viscous and friction dampers to improve their seismic performance while preserving their architectural and material characteristics. The results obtained highlight the benefits of strengthening techniques and energy dissipation devices in improving the dynamic and seismic behavior of structures. They contribute to a better understanding of structural response mechanisms under dynamic loading and emphasize the potential of the proposed solutions to enhance the safety, durability, and resilience of both conventional and traditional structures under seismic actions.

**Keywords:** Structural dynamics, seismic engineering, nonlinear modeling, energy dissipation, fiber-reinforced composites, rammed earth structures