

Civil Engineering & Architecture : **Design, Construction, Rehabilitation, and Resilience of the Built Environment**

1-Program Team:

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2-Program Description:

Major advances have taken place in recent years in: the design, construction and rehabilitation of the built environment; the understanding of the hazards it is exposed to; and the approaches for reducing disaster risk and for enhancing the resilience of the built environment (resilience being the ability to reduce the impact of catastrophes and to recover quickly after a disaster).

The program will cover broad areas of design (civil and earthquake engineering, architecture, planning). While most of the concepts and techniques to be presented are also applicable to other infrastructure elements such as bridges, the emphasis will be on the evaluation and retrofitting (or rehabilitation) of existing buildings, including historical buildings. The earthquake resistance of new buildings is addressed by the building code and its enforcement, but that of existing buildings (a major component in the fabric of many cities in Algeria) represents a real concern, particularly due to the lack of detailed information regarding concealed original assemblies and material properties, their current condition, and the difficulty associated with selecting performance objectives for the retrofitted buildings.

The program will focus on the evaluation and retrofitting (or rehabilitation) of existing structures in seismic areas as follows:

- Primary topics will include: building damage analysis; non-destructive testing and ambient vibration testing; retrofit technology, including the use of polymer and carbon fiber composites; advances in techniques for the preservation of historic buildings and monuments; and analysis and design standards for existing buildings.
- Secondary, complementary topics will include recent advances in civil and earthquake engineering, such as: advanced topics in concrete (materials, confined concrete modeling, seismic design); modeling and analysis methods, emerging concepts in modern building codes; modeling of catastrophic risk and disaster risk management; and resilience of interdependent infrastructure systems and communities.
- Case studies in the evaluation and retrofitting of existing structures, disaster risk management, and resilience will be presented and discussed. Workshops will be held to further investigate specific topics or demonstrate the use of relevant specialized analysis software.

The goal of this AAF Summer University program is to provide advanced training to doctoral students who will be educating the future civil engineers and architects, and to enhance their ability to conduct relevant, up-to-date research in earthquake engineering and disaster risk management.

3-Covered topics:

This broad program will cover basic concepts, advanced techniques and recent scientific and technological advances in the field, including:

- Non-destructive evaluation and rehabilitation of existing concrete and masonry buildings and structures
- Advanced topics in concrete (materials, confined concrete modeling, seismic design)
- Modeling and analysis methods for structures and continua
- Seismic design principles for new buildings
- Seismic evaluation and retrofit of existing buildings
- Interventions on historic buildings and monuments
- Modeling of catastrophic risk
- Resilience of interdependent infrastructure systems and communities.
- Workshops on case studies and software demonstrations
- "Blitz" presentations by doctoral students highlighting their research, followed by a question and answer period.

4-Desired Learning Outcomes:

Participants will be exposed to the latest technologies and learn theoretical and practical knowledge on diverse relevant aspects of the design, construction, rehabilitation and resilience of the built environment. The lecturers will guide and assist participants working in academia, research centers, and engineering design and construction companies to develop their skills and will explore the possibility of building a network of researchers and practicing engineers in various fields in Algeria and abroad to consider future collaborative projects and initiatives.

5-Who Should Attend the Course?

Doctoral students, post-doctoral researchers, faculty, graduate students and practicing engineers and architects in the design and construction industry will benefit from this program.