International Doctorate in Civil and Environmental Engineering

DOCTORAL COURSE A.Y. 2021/22

Probabilistic methods for reliability and risk assessment with applications to structures equipped with seismic passive protection devices

Teacher: Prof. **Fabrizio Scozzese**
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Calendar	
03/11/2022 – 11:00-13:00 and 15:00-17:00 – The course will be held in presence in Pisa – Room to be confirmed	1. Introduction to seismic risk and seismic reliability analysis of structures 2. Advanced statistical simulation methods (Monte Carlo, Subset Simulation, etc.) 3. Conditional probabilistic approaches (based on the use of Intensity Measures) 4. Stochastic ground motion models 5. Discussion
04/11/2022 – 11:00-13:00 and 15:00-17:00 – The course will be held in presence in Pisa – Room to be confirmed	1. Critical review of Code provisions for seismic design of anti-seismic devices 2. Reliability assessment of structures with fluid viscous dampers 3. Influence of the ultimate capacity of fluid viscous dampers 4. Reliability assessment of seismically isolated structures 5. Discussion and conclusions
Total	8 hours – 4 credits

Program

Abstract

Seismic passive protection with anti-seismic devices (such as energy dissipation dampers or seismic isolators) represents an efficient strategy to produce resilient structural systems with improved seismic performances and notably reduced post-earthquake consequences. However, structural systems equipped with seismic control devices can show potentially limited robustness, since an unexpected devices' early disruption may lead to a progressive collapse of the actually non-ductile system. Although the most advanced international seismic codes acknowledge this issue and require both dampers and isolators to have higher safety margins against the failure, they only provide simplified approaches to cope with this problem, which often consist of general demand amplification rules not tailored on the real needs of different device typologies. As a consequence, the actual reliability levels remain unknown.
This short course addresses the aforementioned problems by analyzing two widely employed passive protection strategies, namely: energy dissipation through fluid viscous devices, and seismic isolation with high-damping rubber bearings. A thorough review of both conventional and advanced probabilistic methods (e.g., Subset Simulation) is also provided due to the fundamental role played by such tools for a reliable seismic risk quantification. Moreover, it is discussed about the use of stochastic ground motion models as suitable components of a robust probabilistic framework.

Biography

Dr. Fabrizio Scozzese is currently researcher at the University of Camerino and Adjunct Professor in "Structural engineering" and "Structural problems of historical buildings" within the (Bachelor and Master) Architecture courses of the School of Architecture and Design (University of Camerino). He holds a MEng in Civil Engineering from Polytechnic University of Marche and a PhD in Science and Technology – Computer Science – from the International School of Advanced Studies of the University of Camerino.
He is author of several international scientific papers, he serves as editorial board member for various scientific journals and he is organizer of national conferences (e.g., ANIDIS 2019, FABRE Congresses, etc.) and international conference sessions (e.g., COMPDYN 2019/2021, IALCCE 2023, etc.). His research focuses on different fields of structural engineering, among which: probabilistic tools and risk quantification methods, seismic vibration control systems, structural safety and seismic reliability, seismic design of structural and non-structural components, steel structures, structural health monitoring of structures and infrastructures.