Structural Health Monitoring and Dynamic Identification of Structures

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Doctoral Course (12 h)

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ABSTRACT
This doctoral course treats fundamental topics concerning the field of Structural Health Monitoring (SHM), with target also on the Structural Analysis of Historical Constructions (SAHC), in terms of assessment and preservation of structural heritage. Recording abnormal dynamic behavior, evaluating serviceability, detecting diffused and localized damage, estimating residual performance capacity are crucial aspects of SHM. Monitoring of infrastructure systems, also referred to as Structural Health Monitoring, can be a valuable source of information for evaluating structural integrity, durability and reliability throughout the structural life cycle as well as ensuring optimal maintenance planning and safe operation. The more recent developments in sensor technology and communication networks have allowed for the rapid deployment of dense sensor arrays at a relatively low cost. As a result, advanced computational methods are required in order to process and interpret the large bulk of the obtained information, in view of consistent structural identification. The proper combination of hardware resources and theoretical tools can ultimately lead to a "smart infrastructure management system", where structural assessment no longer depends merely on sporadic visual inspections.

In particular, this doctoral course will treat the following topics:
- implementation of wireless sensor networks for the monitoring of civil infrastructures;
- metamodeling of structural systems with parametric uncertainty subjected to stochastic excitations;
- application of frequency- and time-domain system identification methods with fusion of heterogeneous sensory information.

During the course numerical lab activities are planned with the use of MATLAB and SIMULINK.

Prof. Eleni Chatzi is Assistant Professor at the Institute of Structural Engineering, ETH Zurich since 2010. She has obtained her Diploma (2004) and MSc (2006) in Civil Engineering from the Department of Civil Engineering at the National Technical University of Athens (NTUA). She then pursued graduate studies at the Department of Civil Engineering and Engineering Mechanics at Columbia University, New York, where she was awarded the degrees of M.Phil. and Ph.D. in 2008 and 2010, respectively. She has published numerous articles in peer-reviewed international journals with particular focus on system identification methods and topics relating to Structural Health Monitoring, vibration monitoring, and nonlinear dynamics.