UNIVERSITÀ DEGLI STUDI DI BERGAMO | Scuola di Ingegneria

University of Bergamo

Doctoral Programme in Engineering and Applied Sciences

School of Engineering, viale G. Marconi 5, Dalmine (BG)

An Introduction to System Identification, State Estimation and Health Monitoring of Structures

Doctoral Course (12 h): 6-10 May 2019

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ABSTRACT

This is a block doctoral course on the fundamental topics of structural identification and health monitoring, and on individual relevant research areas that include time series analysis, adaptive signal processing and state estimation, as well as data-driven uncertainty quantification. Upon completion, students will be able to understand the basic concepts of stochastic processes and time-series, identify the structural modes from vibration response data, perform adaptive signal processing, e.g. for noise cancelation, estimate displacements and velocities on structures in unmeasured positions via stochastic observers (e.g. Kalman filters), and familiarize themselves with state-of-the-art damage detection and identification methods. A basic knowledge of structural vibration and systems theory is required, although an overview of the required background material will be provided as well. The course's contents are summarized as follows:

1. Overview – mathematical background
2. Time series analysis: basic concepts and parametric modelling
3. Subspace identification
4. State Estimation
5. Surrogate modelling for nonlinear and time varying systems
6. Basics of structural health monitoring

The above contents will be accompanied with hand-on tutorials in MATLAB and SIMULINK.

Dr. Vasileios Ndertimanis received the Diploma in Mechanical Engineering from the University of Patras, Greece and the Ph.D. Degree from the National Technical University of Athens (NTUA), Greece, in the area of modeling and identification of faults in mechanical and structural systems. His research interests are in the area of system identification and structural health monitoring, lineal and nonlinear state estimation, active and passive structural vibration control, hybrid testing and optimization. He has served as a Researcher in the NTUA Vehicles Laboratory, the Machine Design Laboratory and the Laboratory for Earthquake Engineering. For more than a decade, he has in parallel self-employed as a freelancer engineer and inspector, as well as measurement engineer and structural vibration analyst. Since 2014, he is a member of the Chair of the Structural Mechanics, ETH Zurich and as of May 2017, he is a Senior Researcher in the chair supporting activities on Monitoring and Dynamic Testing.

Indicative course calendar:

Day 1 – Mon. May 6

15:00 – 19:00 (room B001)

Day 2 – Thu. May 9

09:00 – 13:00 (room C302)

Day 3 – Fri. May 10

09:00 – 13:00 (room C302)

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