## Oreste S. Bursi

Oreste S. Bursi graduated in Mechanical Engineering at the University of Padua in 1984, and achieved his PhD. in Mechanical Engineering at the University of Bristol. He worked as a visiting professor at the University of Boulder, Colorado, in the period 1989-1990 and at the University of Bristol in the year 2005. He is Full Professor of Structural Dynamics and Control at the University of Trento, teaching Seismic Engineering and Theory and Design of Bridges. The research activity is mainly devoted to the pseudo-dynamic test method, non-linear dynamics, control and structural identification. He is co-ordinator of EU and national research projects. He is author of over 150 technical publications. For further information, please refer to the URL: *www.ing.unitn.it/~bursi*

## Rosario Ceravolo

Rosario Ceravolo received a Laurea degree in Civil Engineering and a PhD in Structural Engineering both from Politecnico di Torino. He has been invited researcher at the Ecole Nationale des Ponts et Chaussées (2001) and professor in Structural Health Monitoring at Université Paris-Est (2009). Associate Professor of Earthquake Engineering & Structural Dynamics at the Politecnico di Torino since 2003, he is member of the board of the multidisciplinary PhD course in Cultural Heritage. Author of 130 technical publications on various subjects, including structural health monitoring, dynamic identification, seismic isolation, structural reliability, seismic risk of architectural heritage.

Department of Mechanical
and Structural Engineering
University of Trento
Via Mesiano 77, 38123 Trento
Tel. 0461-282503 Fax. 0461-282599

University of Trento

Doctoral School in
Engineering of Civil and
Mechanical Structural Systems

UNIVERSITÀ DEGLI STUDI DI TRENTO

# Identification and Control of Dynamical Systems

Course offered by Oreste S. Bursi and Rosario Ceravolo

June 4-8, 2012

Department of
Mechanical and Structural Engineering
University of Trento

## Course objective

The primary purpose of this course is to provide the bases of classical control theory and some modern control techniques. Also, modern structural control concepts will be presented. Moreover, several concepts and applications of identification for linear and non-linear systems will be treated in depth.

## Who should attend

Graduate students in aerospace, civil and mechanical engineering, researchers, professional interested in identification and control of dynamical systems

## Course outline

**Translational mechanical systems and standard forms for system models**. Interconnection laws. System models. State-variable equations. Input-output equations. Matrix formulation of state variables.

**Transfer function analysis**. The Laplace transform and solving of linear ODEs. The transfer function. Block diagrams. Time and frequency-domain analysis of system response. Absolute and relative stability analysis. Output feedback stability.

**Single input and single output (SISO) system control**. Control system design. Specifications. PID control. Sensitivity to perturbances and parameter variation. Complex control structures. Discrete-time control system design.

**Multivariable system control and structural control.** State-space representations. State feedback control. State observers. Reference-model control design. Model reference adaptive control. Active, hybrid and semi-active structural control. Laboratory Demonstration.

**Fundamentals of system identifications and applications.** Fundamentals of vibration-based Structural Health Monitoring. Theoretical and experimental modal analysis. Concepts of signal analysis. Workshop 1: introduction to signal processing tools for structural identification. Identification in the frequency domain. Identification in the time domain. Experimental modal analysis: examples and applications to full-scale civil structures. Workshop 2: introduction to time domain identification tools.

**System identification for linear and non-linear systems and applications** Identification in time-frequency domain. System identification and control of full-scale civil structures. Non-linear system identification. Workshop 3: introduction to advanced problems in system identification. Non-linear system identification: examples and applications to full-scale civil structures.

## Course schedule

Monday, June 4, 2012
DIMS Room
10.00-13.00
14.30-18.30

Tuesday, June 5, 2012
DIMS Room
9.00-13.00
14.30-18.30

Wednesday, June 6, 2012
DIMS Room
9.00-13.00
14.30-18.30

Thursday, June 7, 2012
DIMS Room
9.00-13.00
14.30-18.30

Friday, June 8, 2012
DIMS Room
9.00-13.00
14.30-17.00

## Information

The course is free of charge.
For further information, please contact
Ms. Rosanna Verones
Department of Mech. and Struct. Eng.
Via Mesiano 77, 38123 Trento
Tel. +39-0461-282503
Rosanna.verones@ing.unitn.it