



Zbigniew Zembaty

Zbigniew Zembaty obtained his Ph.D in 1987 at the Opole University of Technology in Poland, where actually he holds a position of associate professor at the Faculty of Civil Engineering. His

research specializations are random vibrations and reliability, dynamic identification, seismic engineering. He cooperated with numerous research teams (Italy, Israel, Denmark, Slovakia, Czech Rep.) and is a visiting professor in Trento Univ. and Technion, Haifa. He is the author or co-author of about 70 scientific publications, including 30 papers published in peer reviewed journals and two books. He is a reviewer of many leading scientific journals, member of *Am. Geophysical Union*, *European Assoc. of Earthquake Eng.* etc.. His engineering activity includes consulting mine authorities to mitigate surface effects of deep mining and consults Polish branch of ABB on seismic resistance of electric disconnectors exported to countries with seismic risk. For more information see:

www.zet.po.opole.pl



Oreste S. Bursi

Oreste S. Bursi graduated in Mechanical Engineering at the University of Padua in 1984, and achieved his Doctorate in Mechanical Engineering. 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 Mechanics 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. It also comprises several contributions related to the study of steel-concrete structural systems. He is co-ordinator of EU and national research projects. He is member of the UK network HYBTESTNET, reviewer of several International Journals, peer reviewer of research projects financed by the European Union and by the Italian Ministry of Education, University and Research (MIUR). He is author of over 150 technical publications. For further information see: www.ing.unitn.it/~bursil

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University of Trento

Doctoral School in
Engineering of Civil and
Mechanical Structural Systems



Random Vibrations,
Control and Reliability
of Dynamical Systems

Course offered by
Zbigniew Zembaty and Oreste S. Bursi

April 16-20, 2007

Department of
Mechanical and Structural Engineering
University of Trento

Course objective

The scope of the course is to give a basic knowledge of random vibrations and reliability of dynamical systems with some elements of control and structural control.

Who should attend

Graduate students in structural engineering, researchers, professional interested in dynamical systems

Course outline

Fundamental of probability theory and random variables. Basic formulas and theorems of probability theory. Conditional probability. Bayes theorem. Continuous and discrete random variables, their description and parameters. Selected probability distributions.

Spectral and correlation theory of stochastic processes. Scalar and vector stochastic processes, Gaussian and Poisson processes. Correlation function and spectral density of stationary & non-stationary random processes. Method of evolutionary spectra. Stochastic model of seismic ground motion. Random fields and their description. Stochastic model of

spatial seismic excitations. Simulation of stochastic processes and Monte Carlo methods. Random vibrations of nonlinear systems using simulations of stochastic processes.

Stationary and non-stationary random vibrations. Single Degree of Freedom Systems. Response to white noise and broadband excitations, Multi Degree of Freedom Systems. Method of evolutionary spectra. Response by direct method and mode superposition method.

First excursion problem and reliability formulation.

Rice formula. First excursion problem in stationary random vibrations. Peak factor. First excursion problem in non-stationary random vibrations and peak factor. First excursion problem in multi-dimensions. Applications in seismic engineering.

Control and structural control. System response. Laplace transform. Z-transform. Dynamic system models. Block dynamic models. Steady-state error. Poles, zeros and stability. Root locus analysis. Adaptive controllers. Applications of Structural Control

Course schedule

Monday, April 16, 2007

DIMS Room

9.30-13.00 Z. Zembaty

14.30-18.00 Z. Zembaty

Tuesday, April 17, 2007

DIMS Room

9.00-13.00 Z. Zembaty
14.30-18.30 O.S. Bursi

Wednesday, April 18, 2007

DIMS Room

9.00-13.00 Z. Zembaty

14.30-18.30 O.S. Bursi

Thursday, April 19, 2007

DIMS Room

9.00-13.00 Z. Zembaty

14.30-18.30 O.S. Bursi

Friday, April 20, 2007

DIMS Room

9.00-13.00 Z. Zembaty

Information

The course is free of charge.

For further information, please contact
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