Course 102:
Instrumentation, monitoring and Analysis of Recorded Motions from Structures Using OMA

Sunday, February 11, 2018 | 9:00 a.m.–5:00 p.m.

Course Description

This is a one-day course covering various aspects of instrumentation, monitoring and analysis of recorded motions in structures arising from dynamic excitations. The course will discuss practical aspects of instrumentation of structures, as well as the theory behind operational modal analysis techniques for vibration data. The use of these techniques will be illustrated by several application examples from instrumented structures, which include laboratory tests as well as in-situ tests of buildings and bridges.

Who Should Attend

Engineers and researchers who have basic knowledge of structural analysis and who would like to expand their knowledge into the field of instrumentation of structures and Operational Modal Analysis. As design codes are now requiring instrumentation and monitoring of structures, this course will provide valuable insight into the usefulness of state of the art technology to better understand the dynamic response of structures and how to improve future designs.

Course Content

- Welcome and Introduction: What is Operational Modal Analysis (OMA)?; Practical value of instrumentation of structures; Modal identification of structural systems
- OMA basic assumptions and concepts: Gaussian white noise assumption; Transforms, Fourier, Laplace and Z-transform; Linear algebra tools, EVD, SVD.
- Dynamic response of structures: Linear systems in continuous time; Free decays in discrete time; Closely spaced modes
- Instrumentation of structures: Classical OMA sensor planning; Instrumentation of large structures; The single input case problem
- Signal processing of recorded data: Preprocessing: Correlation function estimation; Spectral density estimation
- Time domain techniques: Polyreference, Ibrahim time domain, ERA; SSI
- Frequency domain techniques: Simple peak picking; Frequency domain decomposition (FDD), frequency domain polyreference
- Examples of identification: Buildings; Bridges; and other structures
- General discussion and future developments

Course Fee/Cancellation

The regular fee is $500 and the student fee is $250. Course fee includes course handout material and refreshment breaks. Lodging, additional food and other materials are not included. If the course is cancelled for any reason, the Society for Experimental Mechanics' liability is limited to the return of the course fees.

Instructor(s):

Prof. Rune Brincker—Aarhus University

Rune Brincker is a civil engineer and received his M.Sc and Ph.D. from the Technical University of Denmark in 1977 and 1981, respectively. Since then he has been conducting research on various aspects of structural mechanics. Rune has been employed as associate and full professor at several Danish universities. Presently he is a professor of structural dynamics at the Technical University of Denmark. During the last 30 years his research has been focused on operational modal analysis (OMA), and one of his major contributions to this field has been the development of the frequency domain decomposition (FDD) identification technique, which has been used in many practical applications of OMA. Rune Brincker is a co-founder of Structural Vibration Solutions (SVS) founded in 1999; and he is the founding chair of the International Operational Modal Analysis Conference (IOMAC) which started in 2005.t

Instructor(s):

Prof. Carlos E. Ventura

The University of British Columbia

Carlos Ventura is a Civil Engineer with specializations in structural dynamics and earthquake engineering. He has been a faculty member of the Department of Civil Engineering at the University of British Columbia (UBC) in Canada since 1992. He is currently the Director of the Earthquake Engineering Research Facility (EERF) at UBC, and is the author of more than 470 papers and reports on earthquake engineering, structural dynamics and modal testing. Dr. Ventura has conducted research about earthquakes and structural dynamics for more than thirty years. In addition to his academic activities, Dr. Ventura is a recognized international consultant on structural vibrations and safety of large Civil Engineering structures. He is a member of the Canadian Academy of Engineering and Fellow of Engineers Canada, also a member of several national and international professional societies, advisory committees and several building and bridge code committees.