

Course 103: Model Updating for Validation: Theory & Practice

Sunday, January 31, 2010, 8:00 AM - 6:00 PM

Instructors

Dr. Scott Cogan, University of Franche-Comté
Prof. Emmanuel Foltête, ENSMM

Course Description

This short-course provides the student and analyst with a succinct overview of the goals and methods of model revision and updating within the overall process of Model Verification and Validation in structural elastodynamics. The morning session will be a lecture format dedicated to developing a vision of the essential steps involved in performing model updating in an industrial context. The afternoon session will be organized around a hands-on tutorial problem using in-house software that has been developed over the years in our laboratory to address the problem areas of modal identification, model correlation and model updating in an industrial setting.

In order to make optimal use of the limited time available for this one-day course, the participants will be asked to install the necessary software in advance on their own portable computers that they will use in the afternoon session. Please note that compatibility will only be insured for computers running the Windows XP (SP3) operating system. A detailed description of the installation process along with some simple benchmarks will be sent to each participant by early January 2010.

Who Should Attend

Graduate students who need to learn the state-of-the-art in *Model Revision and Updating* and how to apply and extend the methodologies to their research. Engineers and analysts who have a basic knowledge of modal analysis and seat-of-the-pants calibration of finite element models but who would like to expand their knowledge to a more systematic approach.

Course Schedule

Morning Theoretical Session

Overview

Session Goals
V&V

Structural Dynamics

Equations of Motion
Reduced Models

Model Verification

Grid Convergence
Model Reduction

Decision Robustness

Lack-of-Knowledge
Info-Gap Analysis

Optimal Test Design

Pickup Design
Excitation Design

Dynamic Testing

Modal Analysis
Feature Extraction

Test Verification

Reference Frames
Rigid Supports

T/A Mesh Reduction

Common Model Frame
Local Node Frames

T/A Correlation

Feature Definition
Distance Metrics

Sensitivity Analysis

Local Methods
Global Methods

Error Localization

Model Error Visibility
Error Localization

Model Correction

Manual Revision
Automatic Updating

Model Reanalysis

Model Reduction
Metamodels

Updating Assessment

Retrodiction
Prediction

Afternoon Hands-on Session

The afternoon session will be based on our in-house software. A fast-running tutorial example will be used to illustrate the main steps of the model updating process presented in the morning session. The participants will follow a step-by-step tutorial document guiding them through the different steps of the model updating process using real test data. The final updating results will be synthesized at the end and form the basis of a round-table discussion that will end the workshop.

Instructors



Scott Cogan



Emmanuel Foltête

The instructors are **Scott Cogan**, Senior Research Fellow with the CNRS at the University of Franche-Comté (scott.cogan@univ-fcomte.fr), and **Emmanuel Foltête**, Professor at the Ecole Nationale Supérieure de Mécanique et Microtechnique (emmanuel.foltete@ens2m.fr).

The instructors have extensive experience in all phases of the model updating and validation process for structural dynamic applications in the domains of aeronautical, aerospace, and automotive engineering.

Course Fee

The *regular* course fee for Model Updating for Validation :Theory and Practice is \$350, and the *student* course fee is \$175. Course fee includes box lunch, course handout material, and refreshment breaks. Lodging and additional food or materials are not included