
Hands-On Modal Testing & Analysis – Administrative Information

(March 2nd – 5th, 2010; July 20th – 23rd, 2010; November 2nd – 5th, 2010)

Background Discussion & Abstract: Navcon Engineering is a consulting firm specializing in noise and vibration measurement, analysis and control. We have been presenting modal testing seminars since 1990. Our Hands-On Modal Testing & Analysis seminar is truly unique covering both the theoretical and experimental sides of modal testing. The course focuses upon the practical aspects of modal testing including test planning, data acquisition, data reduction, parameter estimation and results presentation. We also present case studies showing how modal test results can be applied to noise and vibration mitigation projects, the verification of analytical models, the assessment of structural health, etc.

Attendees are encouraged to bring a laptop computer with them for use during the laboratory exercises. We will load a fully functional copy of **ME'Scope™** & **FEMtools™** on the laptops which will operate for 30 days. The software can be used to repeat the laboratory exercises after the class or for the analysis of the attendees' modal test & finite element data.

Intended Audience: This intensive four-day course has been designed for engineers and technicians, who are tasked with modal data acquisition, data reduction and analysis. The course is structured to be of benefit to both beginners and the more experienced testing specialists. The class is often attended by FE analysts who want to know more about the data provided them by the test engineer and by Project Managers who direct modal testing projects.

Course Objective: By the end of this training, attendees should have gained the knowledge and the hands-on experience needed to conduct a modal survey test from start to finish.

Presenter: Jim Steedman, president of Navcon Engineering, has personally conducted more than 300 modal tests. He received his bachelors and masters degrees from the University of Cincinnati where he concentrated on modal testing, structural dynamics modification and acoustics. He has consulted in the field of noise and vibration measurement, analysis and control since 1977. Jim has traveled worldwide consulting and presenting courses on acoustic intensity, environmental noise, modal testing and noise & vibration control.

Registration: Advanced registration is required. You can register online or complete and return the enclosed registration form. The registration form can be downloaded from our web site (<http://www.navcon.com/HandsOnModal.htm>). The number of participants is limited and early registration is recommended.

Course Fee: **\$2,150** per attendee. The course fee includes participation, seminar manual, lunches and refreshments. A full refund will be made for all cancellations received 30 days before the start of the course. No refunds will be granted after the 30 day deadline. Substitute attendees will be accepted at any time. In the event that we have to cancel the course, the course fee will be refunded in full, but we disclaim any further liability.

Hands-On Modal Testing & Analysis – Course Outline

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Fourier Analysis

- Fourier Integral
- Fourier Series
- Time-Frequency Domain Relationships
- Harmonic motion

Digital Signal Processing

- Analog to Digital Converters
- Sampling Parameters
- Aliasing
- Leakage & Windowing

Measurements

- Linear System Relationships
- Mathematical Relationships
- Frequency Response & Coherence
- Input, Output & Cross Power
- Time Domain Measurements

Introduction to Modal

- Modal Definitions
- Layman's Visualization
- Lumped, Continuous & Finite Element Models
- Normal Mode vs. Frequency Response Method
- Modal Parameters & Estimation Methods

Single Degree of Freedom Systems

- Characteristic Equation
- Frequency Response Derivation
- Transfer Function on the S-plane
- Transfer Function in Partial Fraction Form
- Mass, Stiffness and Damping sensitivity

Excitation Techniques

- Single & Multiple Shaker Techniques
- Impact Excitation Method
- Acoustic Excitation Method
- Excitation Signal Types

Modal Test Preparation & Measurements

- Modal Test Overview
- Pretest Considerations
- Detailed Test Procedures
- Computer Models & Visualization
- Understanding Modal Measurements

Modal Theory

- Analytical Approach
- Test Approach

Modal Parameter Estimation

- SDOF & MDOF Estimators
- Time & Frequency Domain Estimators
- Local & Global Estimators

Operating Deflection Shapes

- Time Domain ODS
- Frequency Domain ODS

Laser Vibrometry

- Full Field Scanning Laser Vibrometry
- Single Point Measurements

Selected Laboratory Exercises

- Signal Processing
- Impact Testing
- Excitation Techniques
- Modal Test - JimBeam
- Modal Test – Race Prepared Porsche
- ODF – Time & Frequency Domain

Hands-On Modal Testing & Analysis – Course Registration Form
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Name(s)
Company
Address
City, State, Zip
E-Mail
Phone Fax
Date Signature
Class Date	March 2 – 5, '10 <input type="checkbox"/> July 20 - 23, '10 <input type="checkbox"/> Nov 2 - 5, '10 <input type="checkbox"/>
Payment	P.O. No. Company Check <input type="checkbox"/> Payment: US \$ _____ Bank Transfer <input type="checkbox"/> Credit Card: Visa <input type="checkbox"/> MasterCard <input type="checkbox"/> Credit Card #: _____ Expiration Date: ____ / ____ Name on Credit Card: _____ Billing Address: _____ Billing Zip Code: _____ Card Verification Value CVV #: _____ (3 digits on the back)

Course Fee: \$2,150 per attendee. We accept company purchase orders with terms of Net 15 days, company checks, money orders, bank transfers and credit card (Visa, MasterCard). The course fee includes participation, course notes, lunches and refreshments. A full refund will be made for all cancellations received 30 days before the start of the course. No refunds will be granted after the 30 day deadline. Substitute attendees will be accepted at any time. In the event that we have to cancel the course, the course fee will be refunded in full, but we disclaim any further liability.

For administrative & technical questions please call: +714-441-3488.

To register, complete and Fax this form to +714-441-3487.