

Course 101: Modal Analysis: Theory & Application

Friday, January 29 - Saturday, January 30, 2010, 8:00 AM - 6:00 PM

Instructors

Dr. David L. Brown, University of Cincinnati
Dr. Randall J. Allemang, University of Cincinnati
Dr. Peter Avitabile, University of Massachusetts, Lowell

Course Description

Modal analysis theory, modal test methods, modal parameter estimation and applications are explored in this intensive two-day course by distinguished lecturers in this field. Lectures will be reinforced with demonstrations as lecture material is discussed. This format provides immediate comprehension and understanding of the theoretical and practical aspects of modal analysis methods. At the completion of this course you will have an understanding of modal analysis theory, experimental techniques, and potential applications. Based upon the time limitations, the course will only focus on providing an overview of the subject material. Demonstrations will include excitation techniques, parameter estimation techniques, and some advanced processing of data.

Who Should Attend

The course is directed toward people currently working in this technology who want to increase their understanding of current and updated modal analysis theory and application. The material presented is also appropriate for product design engineers, design evaluation engineers, and in-service structural failure investigators concerned with the methodology of correlating experimental modal analysis and analytical modal analysis.

Course Schedule

Day 1 – Friday

7:30-8:00	Registration
8:00-9:00	Objective & Application of Modal Analysis, <i>Brown</i>
9:00-10:00	Basic Modal Analysis Theory – Part 1, <i>Avitabile</i>
10:00-10:15	BREAK
10:15-11:00	Basic Modal Analysis Theory – Part 2, <i>Avitabile</i>
11:10-12:00	DFT Theory and FFT Techniques, <i>Allemang</i>
12:00-1:00	LUNCH (Provided)
1:00-2:00	FFT Accuracy Improvements/Windowing, <i>Allemang</i>
2:00-3:00	Basic Measurement Techniques, <i>Brown</i>
3:00-3:15	BREAK
3:15-4:00	Impact Measurement Demonstration, <i>Brown, Allemang, Avitabile</i> (Hammers, Tips, Gxx, H, Coh, misc problems)
4:00-5:00	Transient & Steady State Excitation Techniques, <i>Brown</i>
5:00-6:00	Shaker Excitation Demonstration, <i>Brown, Allemang, Avitabile</i> (Random, Burst Random, Cyclic Averaging, Chirp, SISO, MIMO)

Day 2 – Saturday

8:00-9:00	Basic Modal Parameter Estimation Methods, <i>Allemang</i>
9:00-10:00	Advanced Modal Parameter Estimation Methods, <i>Allemang</i>
10:00-10:15	BREAK
10:15-11:00	Modal Parameter Estimation Tools, <i>Avitabile</i>
11:10-12:00	Demonstration Modal Parameter Estimation, <i>Allemang</i>
12:00-1:00	LUNCH (Provided)
1:00-2:00	Structural Dynamic Modification – Modal Models, <i>Avitabile</i>
2:00-3:00	Structural Dynamic Modification – Impedance Models, <i>Brown</i>
3:00-3:15	BREAK
3:15-4:00	Correlation Test and Analysis, <i>Avitabile</i>
4:00-4:30	Operating Data – Output Only Systems, <i>Brown</i>
4:30-5:00	Nonlinearities, <i>Allemang</i>
5:00-6:00	Case Histories & Review, <i>Brown, Allemang, Avitabile</i>

Instructors



Dr. David L. Brown is Professor Emeritus of Mechanical Engineering at the University of Cincinnati, Ohio. Dave is an international consultant and lecturer on signal processing, dynamic measurement, modal analysis and system dynamics. Dave has published extensively in these areas and has been invited to give numerous keynote presentations at conferences including the keynote presentation at both the first IMAC, as well as the 25th Anniversary IMAC. Dave has an academic background in both Aerospace and Mechanical Engineering and has over 40 years of experience in the area of vibrations and experimental modal analysis.



Dr. Randall J. Allemang is a Professor of Mechanical Engineering at the University of Cincinnati, where he also serves as Associate Director of the UC-Structural Dynamics Research Laboratory. Randy has been very active in experimental modal analysis research and has published numerous technical articles in the areas of experimental modal analysis, measurement and modal vector assessment and modal parameter estimation. Randy has served as Chairman of the IMAC Advisory Board and President of SEM and

has over 30 years of experience in measurements and experimental modal analysis.



Dr. Peter Avitabile is a Professor of Mechanical Engineering at the University of Massachusetts, Lowell, and is the Co-Director of the Structural Dynamics and Acoustic Systems Laboratory. Pete has over 30 years of experience in design and analysis using FEM and experimental modal analysis techniques. Pete's main area of research is structural dynamics specializing in modeling, testing and correlation of analytical and experimental models. Pete has published his research widely and contributed many technical papers

and articles to IMAC and SEM including his "Modal Space" Department series in *Experimental Techniques*.

Quotes from Prior Attendees

"This is a course I would recommend to people involved with measurements, ... so that they can understand the data and, ... work toward better results."

"This class reinforced concepts I already knew and added concepts which will improve my work in this field."

"I believe that this course is an excellent resource for engineers that have some experience with experimental modal analysis and have questioned data or practices that they have experienced in the past."

Course Fee

The *regular* course fee for *Modal Analysis: Theory & Application* is \$850, and the *student* course fee is \$425. Course fee includes box lunch each day of the course, course handout material, and refreshment breaks. Lodging and additional food or materials are not included.