

# CAE Software for Structural Dynamics

As part of our expanded coverage of Computer-Aided Engineering, ENR presents an overview of CAE software for structural dynamics currently available to experimentalists and analysts. Though it is neither a comprehensive review nor a comparative comparison, it is our hope that this "Best Book" will help introduce our readers to many of the CAE tools for this specific application that are available.

Listings are in alphabetical order by company name. This overview was compiled from information provided by selected software users, software suppliers, suppliers' websites and product literature, as well as the University of Illinois at Urbana-Champaign's National Center for Supercomputing Applications (NCSA) software website, <http://www.ncsa.uiuc.edu/Software/Structural/SoftwareIndex.html>.

For complete information on any of the software products listed, we encourage you to go the web sites of the suppliers and contact their sales representatives. It is not possible to cover all the many features and applications offered by these products in this brief overview. For example, ANSYS contains over 1 million lines of code and many pages of their web site are required to adequately describe the product.

## Product Types

The programs for structural dynamics listed in the Software Tables are categorized into five main types:

**1. Finite Element Analysis.** FEA codes that solve a wide variety of engineering problems. They can model many different phenomena, including the applications that are addressed in this review — analytical modal analysis, linkage of substructures, linear and nonlinear structural response and transient dynamic response.

**2. Experimental Modal Analysis.** Programs that use experimental forced or free vibration vibration measurements to generate a structural model in terms of modal parameters including mode shapes, natural frequencies and damping.

**3. Modal Correlation and Updating Tools.** Software tools specifically designed to compare two structural models with the general intent of improving the dynamic performance of

design of a detailed analytical model so that it properly reflects observations made from verification experiments.

**4. Hybrid Experimental/Test Dynamic Modeling.** Software specifically designed to build a system dynamics model from multiple component models that may be either purely analytical or test-based.

**5. Other Dynamic Modeling Software.** Software that can build structural dynamics models and simulations using analytical methods other than finite elements.

## User Focus

Software suppliers provide products that target almost every level of experience and application. The Software Tables include a column that categorizes each product's user focus into three classes:

1. User of CAE/Analysis software
2. User of CAE (Computer-Aided Testing) software
3. User of CAE/Testing software.

## Pricing

The CAE Software Tables include a column of typical software cost/seat. The pricing of CAE software by suppliers is a complex formula that may involve such factors as the number of seats needed by a given customer, the software modules that are ordered, the usage history, special library package arrangements, site licensing and maintenance contracts. Actual cost of a software package to a given customer may vary substantially from the prices listed in the tables and suppliers' sales representatives need to be consulted for actual licensing and pricing quotations.

Most of the suppliers of CAE software offer special student versions that are potential packages but are limited to a maximum number of elements and nodes. These versions are substantially lower in cost compared to full-function versions, but are restricted for educational purposes. **ENR**

Send comments and suggestions on this new software review service to [enr@mcgraw-hill.com](mailto:enr@mcgraw-hill.com).

Company	Product Name	Type	Features	User Focus	Cost/Seat
ABAQUS, Inc. 401.227.4200 <a href="http://www.abaqus.com">www.abaqus.com</a>	ABAQUS	1	Static and dynamic stress analysis with linear and nonlinear material models, acoustic, coupled structural-acoustic.	1	Contact Vendor
ALGOR, Inc. 412.867.2700 <a href="http://www.ALGOR.com">www.ALGOR.com</a>	Professional Multiphase	1	Includes static stress analysis and mechanical wave propagation (BEM) with linear and nonlinear material models and linear dynamics.	1	25,000+
	Professional SuboLSE	1	Includes static stress analysis and is extensible to nonlinear wave propagation (BEM) with linear and nonlinear material models and linear dynamics.	1	1,000+
	ALGOR/ARTS4D	1	Includes complete 3D/4D/5D solution for static stress with linear material models, hybrid frequency domain, critical buckling load, non-linear material model, wave propagation (BEM) with linear and nonlinear material models and linear dynamics.	1	1,000+
Altair Engineering 248.514.2400 <a href="http://www.altair.com">www.altair.com</a>	HyperWorks	1,2	Modeling, assembly, optimization, simulation and process collaborative tools.	1	—
ANSYS, Inc. 704.514.2000 <a href="http://www.ansys.com">www.ansys.com</a>	ANSYS/CAE Desktop	1	Finite element analysis of linear and nonlinear structural response, buckling, modal analysis, full harmonic response, transient harmonic response, multi-frequency, and fluid flow problems.	1	Contact Vendor
BSI of A. Rize 800.422.2600 <a href="http://www.BSIrize.com">www.BSIrize.com</a>	Structural Dynamic Test/Correlation	2	Suite of software that graphically guides users through modal modal and OEC tests.	2	1,000-10,000
	Operational Modal Analysis	2	Requires only modal analysis, calculates resonance frequency and damping ratio, shape, without measuring input force.	2	1,000-10,000

# Cae Software For Structural Dynamics Sound And Vibration

**Huangqi Zhang**



## **Cae Software For Structural Dynamics Sound And Vibration:**

**Sound & Vibration** ,2000     **Sound and Vibration** ,1985     **NASA Tech Briefs** ,2007     Special Topics in Structural Dynamics, Volume 6 Randall Allemang,2025-08-07 Special Topics in Structural Dynamics Volume 6 Proceedings of the 33rd IMAC A Conference and Exposition on Structural Dynamics 2015 the sixth volume of ten from the Conference brings together contributions to this important area of research and engineering The collection presents early findings and case studies on fundamental and applied aspects of Structural Dynamics including papers on Aircraft Aerospace Active Control Analytical Methods System Identification Sensors and Instrumentation     **Mechanical Engineering** ,1987

Engineering Vibroacoustic Analysis Stephen A. Hambric,Shung H. Sung,Donald J. Nefske,2016-02-18 The book describes analytical methods based primarily on classical modal synthesis the Finite Element Method FEM Boundary Element Method BEM Statistical Energy Analysis SEA Energy Finite Element Analysis EFEA Hybrid Methods FEM SEA and Transfer Path Analysis and Wave Based Methods The book also includes procedures for designing noise and vibration control treatments optimizing structures for reduced vibration and noise and estimating the uncertainties in analysis results Written by several well known authors each chapter includes theoretical formulations along with practical applications to actual structural acoustic systems Readers will learn how to use vibroacoustic analysis methods in product design and development how to perform transient frequency deterministic and random and statistical vibroacoustic analyses and how to choose appropriate structural and acoustic computational methods for their applications The book can be used as a general reference for practicing engineers or as a text for a technical short course or graduate course     **Peterson's Guide to Graduate Programs in Engineering and Applied Sciences** ,1991     *Wave Propagation in Complex Environments, volume II* Leilei Chen,Pei Li,Elena Atroshchenko,Yilin Qu,2025-09-29 The problem of wave propagation such as elastic waves acoustic waves and electromagnetic waves are commonly encountered in a wide range of areas including civil engineering mechanical engineering wireless communication remote sensing meteorology etc In realistic scenarios waves normally propagate in complex environments Electromagnetic waves are transmitted through the medium with small particles that have significant scattering and absorbing effects Sound waves radiated by underwater vehicles in shallow seas are reflected by the sea surface and seabed Wave propagation in complex environments is often associated with multi physics fields Ultrasound waves propagation in porous media can generate heat and elastic waves in piezoelectric materials induce electric fields In addition the physical mechanism of wave propagation in complex environments should be investigated across different scales For example to understand the interaction between light transmission and the matters in the surrounding medium it is necessary to couple particle physics electromagnetics and geometric optics     **The Shock and Vibration Digest** ,2004

**Power Plant Engineering** ,1983     *Proceedings of the ... International Modal Analysis Conference & Exhibit* ,1985

*Advances in Industrial Machines and Mechanisms* Y. V. D. Rao,C. Amarnath,Srinivasa Prakash Regalla,Arshad

Javed, Kundan Kumar Singh, 2021-07-20 This book presents the select proceedings of the 1st International 13th National Conference on Industrial Problems on Machines and Mechanism IPRoMM 2020 and examines issues in the design manufacture and performance of mechanical and mechatronic elements and systems that are employed in modern machines and devices The topics covered include robotics industrial CAD CAM systems mechatronics machinery associated with conventional and unconventional manufacturing systems material handling and automated assembly mechanical and electro mechanical systems of modern machinery and equipment micro devices compliant mechanisms hybrid electric vehicle and electric vehicle mechanisms acoustic and noise control This book also discusses the recent advances in the integration of IoT and Industry 4 0 in mechanism and machines The book will be a valuable reference for academicians researchers and professionals interested in the design and development of industrial machines

Graduate Studies ,1994    ESPRIT '91  
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**The Directory of Graduate Studies** ,1998    **Design News** ,2002    International Aerospace Abstracts ,1998

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web surface finish is the specified smoothness required on the finished surface of that part this surface finish can be obtained by machining grinding honing or lapping etc surface finish is generally required for mechanical components where these components must fit together perfectly move against each other or form a sealing interface

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web this list includes abbreviations common to the vocabulary of people who work with engineering drawings in the manufacture and inspection of parts and assemblies technical standards exist to provide glossaries of abbreviations acronyms and symbols that may be found on engineering drawings

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web surface finish symbols are formed by combining the symbol and lay direction direction of lay for iso and related drafting standards you can display surface finish symbols per 2002 standards by selecting display symbols per

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web to display surface finish symbol settings do one of the following click mechanical toolbox settings in the toolbox settings dialog box in the left pane click annotations and in the right pane expand surface finish symbol click mechanical toolbox symbols surface finish symbols or surface finish symbols mechanical toolbox

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web standard symbols v basic symbol used when surface finish can be produced by any convenient technique modified

symbol finish done by a machining process modified symbol indicating a surface finish without removal of material for example quality of an initial casting roughness value chart 3 a l 50 rough oxy cut

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web australian standard technical drawing part 201 mechanical engineering drawing section 1 scope and general 1 1 scope this standard sets out requirements and recommendations for mechanical engineering drawing practice it is complementary to as 1100 101 the standard provides information on surface texture and welding and the

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web mar 6 2023 surface finish symbols surface finish symbols are used to indicate the degree of precision of the surface in a print the symbols represent various levels of roughness waviness and lay and can be used to analyze the quality of

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web surface finish also known as surface texture or surface topography is the nature of a surface as defined by the three characteristics of lay surface roughness and waviness it comprises the small local deviations of a surface from the perfectly flat ideal a true plane

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web understanding surface roughness symbols symbols that indicate the surface texture of machined and structural parts are used in industrial diagrams the pictorial representation using these symbols is defined in iso 1302 2002 this section will explain how to write these symbols to indicate surface textures

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web surface finish symbols are graphical callouts to indicate surface texture and surface roughness for design parts manufactured by various manufacturing processes the surface finish graphical symbol usage is defined in iso 1302 2002

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web the symbol indicates the surface finish requirements and shows a machining allowance requirement of 3mm on all surfaces symbol for surface texture all component surfaces the symbol indicates that all of the component surfaces are to be machined location of surface texture symbols

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web may 28 2023 published by gayamadhusanka on may 28 2023 surface finish symbols are needed to represent the surface texture requirement to manufacturers if you are working on cnc machining parts or some other manufacturing process then you need to specify the surface finish requirement to manufacture

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web 1 positions of auxiliary symbols for surface symbol a surface roughness value cut off value or reference length machining method grain direction surface undulation etc are indicated around the surface symbol as shown in fig 1 below fig 1 positions of auxiliary symbols a ra value b machining method c cut off value evaluation length

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web nov 11 2021 the ra surface finish chart shows the arithmetic average of surface heights measured across a surface as already mentioned there are three basic components of a surface roughness waviness and lay therefore different factors are affecting the characteristics of surface geometry

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web iso and ansi standards provide guidelines and symbols for surface finish specifications ensuring clear communication between designers and manufacturers a detailed explanation of surface finish units from ra to rz ra average roughness

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web may 12 2020 it is suggested to indicate the surface roughness on drawing by symbols the bis recommended symbols for indicating the surface finish are shown in table a for the roughness values greater than 25µm the symbol is used for roughness value less than 25µm the equilateral triangular symbol is used

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web surface finish symbols callouts and standards in the united states surface finish is usually specified using the asme y14 36m standard the rest of the world commonly uses international organization for standardization iso 1302

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the two terms are sometimes used interchangeably syllables are assigned to the notes of the scale and enable the musician to audiate or mentally h

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