ACOUSTICS LAB
DEPT OF MECHANICAL ENGINEERING
ध्वनिकी प्रयोगशाला

Acoustics lab
Department of mechanical engineering
IIT Kanpur Ph: 0512-3926986

Head : Dr. Nachiketa Tiwari

Software facilities available in Acoustics Lab

No.	Software	Description
1	**MSC Dytran**	Perform explicit Transient Dynamic Solution for improved product safety and reduced warranty costs. • High Performance Computing. • Transient Structural Analysis (Crash/Impact) • Fluid-structure Interaction
2	**MSC MARC Mentat** • MSC MARC_Electrical • MSC MARC_Hexmesh • MSC MARC_Mesh2D • MSC MARC_Mesh3D • MSC MARC_MetalCutting • MSC MARC_ShapeMemory • MSC MARC_ViewFactor • MSC Mentat_CMOLD • MSC Mentat_ITI_Access	Advanced Nonlinear & Multiphysics • Marc is a powerful, general-purpose, nonlinear finite element analysis solution to accurately simulate the response of your products under static, dynamic and multi-physics loading scenarios. • Mentat provides a full range of capabilities for the visualization and interpretation of analysis results. • Tight integration with MSC.Marc means that results can be viewed simultaneously as they are generated.
3	**MSC NASTRAN** • MD ADAMS_Integration • MD Connectors • MD Dynamics • MD Thermal • MD DDAM • MD SMP • MD Linear_Contact • MD Nonlinear • MD MARC_Translator • MD NL_Solver • MD NL_ShapeMemory • MD NL_ViewFactor • MD Acoustics • MD Optimization • MD ACMS • MD Topology_Optimization • MD Superelements	Finite element analysis solver. • Predict Product Life, Optimize Designs • Advanced Nonlinear Capabilities • Develop High Performance Composites • Effectively study the dynamic response of your structural designs • Engineered for High Performance Computing • Competitively Optimize Product Performance • Simulate across multiple analysis disciplines • Multiphysics Simulation

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	- MD DMAP - MD DMP - MD Adv_Nonlinear - MD Aero - MD Rotor_Dynamics - SOFY - SOFY_Acoustic - SOFY_Developer	
4	**MSC Patran** - PA_MSC_NASTRAN - PA_MARC - PA_DYTRAN - PA_ANALYSIS_MANAGER - PA_QUEUE_MANAGER - PA_Adv_Surface_Mesh - PA_BEAM - PA_RandomAnalysis_Tool - PA_IGES_Access - PA_CATIA_Access - PA_AP203_Access - PA_AP209_Access - PA_VDA_Access - PA_IDEAS_Access - PA_ABAQUS - PA_ANSYS - PA_LS_DYNA3D - PA_PAMCRASH - PA_MATERIALS - PA_Materials_Enterprise - PA_PTHERMAL - NASTRAN_Toolkit - PA_FLDS_BASIC	Pre/post-processing software for Finite Element Analysis (FEA), providing solid modeling, meshing, analysis setup and post-processing for multiple solvers including MSC Nastran, Marc, Abaqus, LS-DYNA, ANSYS, and Pam-Crash. - Direct Access of CAD Geometry. - Advanced Geometry Creation, Editing and Feature Recognition. - Support for Multiple FEA Solvers. - Post-processing and Reporting Tools for Easy Results Evaluation. - Patran Command Language. - Enhanced Nonlinear Modeling. - Enhanced Durability Features
5	**MSC SINDA_Solver** - SINDA_Office_Toolkit - SINDA_Rad - SINDA_Patran_Plugin - SINDA_FEMAP_Plugin	Advanced Thermal Simulation Solution - thermal analyzer that has been extensively used in a wide range of successful space programs including Astra, ERS 1-2, Gomos, Mars Express, Silex, Soho, and across multiple industries including Aerospace, Automotive, and Electronics. - Select from a wide number of available thermal loads. - Use fast radiation methods with multiple radiation enclosures.

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		• Model terrestrial heating for solar loads on Airplanes, Automobiles, Solar Power Plants, Civilian Structures, and more. • Add subroutines to model logic and boundary conditions for complex thermal problems. • Utilize micro functions for complex loads without the addition of programming logic. • Include complex special/time/temperature variation of heat fluxes and convections. • Add advanced thermal features including ablation for thermal electric devices and heat pipes.
6	**MSC ADAMS** • MDA_Solver • MDA_Linear • MDA_Solver_SMP • MDA_View • MDA_Exchange • MDA_Controls • MDA_Durability • MDA_Flex • MDA_Insight • MDA_Mechatronics • MDA_Postprocessor • MDA_Vibration • MDA_Vibration_Solver • MDA_3DRoad • MDA_Car • MDA_Car_Plugin • MDA_Car_Mechatronics • MDA_Car_Ride • MDA_Car_Ride_IDTool • MDA_Car_Ride_Solver • MDA_Chassis • MDA_Chassis_Utilities • MDA_Vehicle_Solver • MDA_Foundation_ Classes • MDA_Car_Suspension • MDA_Visual_Edit • MDA_SmartDriver • MDA_Driveline • MDA_Driveline_Solver • MDA_TireHandling	The Multibody Dynamics Simulation Solution • Study the dynamics of moving parts, how loads and forces are distributed throughout mechanical systems. • Optional modules available with Adams which allow users to integrate mechanical components, pneumatics, hydraulics, electronics, and control systems technologies to build and test virtual prototypes that accurately account for the interactions between these subsystems. • Adams/Mechatronics is a plug-in to Adams which can be used to easily incorporate control systems into mechanical models. • Adams/Flex provides the technology to correctly include a component's flexibility even in presence of large overall motion and complex interaction with other modeling elements. • Durability testing is a critical aspect of product development and issues discovered late in the development cycle lead to project delays and budget overruns • With Adams/Vibration, engineers replace physical tests on shaker devices with virtual prototypes. Noise, vibration, and harshness (NVH) are critical factors in the performance of many mechanical designs but designing for optimum NVH can be difficult.

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| 7 | **MSC_EASY5_Analysis**
 • EASY5_Library_ Developer
 • EASY5_MATLAB_ Interface
 • EASY5_Matrix_ Algebra
 • EASY5_Model_ Building
 • EASY5_RT_Analysis
 • EASY5_RT_Library_ Developer
 • EASY5_RT_MATLAB_ Interface
 • EASY5_RT_Model_ Building
 • EASY5_Hydraulic_ Basic
 • EASY5_Hydraulic_Adv | **Advanced Controls & Systems Simulation**
 • Accurately simulate control systems, hydraulics (including thermal effects), pneumatics, gaseous flow, thermal, electrical, mechanical, refrigeration, environment control, lubrication or fuel systems, and sampled-data/discrete-time behavior.
 • Thermal hydraulics: actuation systems, power shift transmission systems, anti-lock braking systems, landing gear, fuel injection systems, active suspension systems, lubrication systems
 • Gas dynamics: pneumatics, propulsion, sterilization, air and steam cycles, high-pressure gas, gas transmission, adsorption, gas phase reactions, HVAC, ECS, multi-species gaseous systems
 • Multiphase fluids: refrigeration, air-conditioning, climate control, cryogenic piping networks, steam/water systems, or fuel systems with exotic, volatile fluids.
 • Systems control hardware and software evaluation (data acquisition sampling rates, asynchronous communication, analog and digital electronic filters, control loop execution rates, network (CAN) bus communication, etc.)
 • Fuel cells: stationary or mobile.
 • Electrical systems: AC/DC machines, power electronics, batteries, etc. Flight dynamics, and control systems of all kinds including digital filters |
| 8 | **Actran**
 • Actran_Level3: (2 licenses)
 • Actran_PreProcess: (5 licenses)
 • Actran_AnalyticMode: (1 license)
 • Actran_Elastic: (1 license)
 • Actran_AdvancedPower: (1 license)
 • Actran_PoroElastic: (1 license)
 • Actran_Diffuse: (1 license)
 • Actran_Corcos: (1 license)
 • Actran_Correlation: (1 license)
 • Actran_PiezoElectric:(1 license)
 • Actran_ModalElastic: (1 license)
 • Actran_Python: (1 license)
 • Actran_Sequential: (1 license)
 • Actran_AR: (1 license)
 • Actran_Acoustic: (1 license)
 • Actran_ViscoThermal: (1 license)
 • Actran_PlaneMode: (1 license)
 • Actran_TMM: (1 license)
 • Actran_PlaneModeConstrained: (1 license)
 • Actran_Flow: (1 license) | Powerful Acoustic Simulation Software, to solve acoustics, vibro-acoustics, and aero-acoustics problems

 • Simulate standard and convected acoustics
 • Extract acoustic modes
 • Analyze sound field in cavities, with either modal or physical approaches
 • Model absorbing walls using impedance conditions of porous material models
 • Analyze sound radiation
 • Analyze sound propagation in ducts, intake and exhaust lines or distribution systems in buildings, aircrafts, and automobiles
 • Recover vibration results from most FEA structural solvers for radiation analysis

 • Actran Acoustics : The most efficient solution for predicting acoustic radiation.
 • Actran VibroAcoustics : Extended tool for fluid-structure coupling
 • Actran for Nastran : Advanced vibro-acoustic analysis combining Actran and Nastran
 • Actran AeroAcoustics : Complex flows noise simulation tool
 • Actran DGM : Jet engine exhaust noise modeling.
 • Actran TM : The leading solution for turbomachinery noise prediction
 • Actran VI : Dedicated pre and post-processor for the Actran CAE software family

 Sample Applications:
 • Sound radiation by vibrating structures: powertrain, engine components (oilpan, intake manifold and air filter, valve cover, etc.), compressors, electrical motors, loudspeakers and more. |

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	- Actran_AcousticHeterogeneity: (1 license) - Actran_MultiLoad: (1 license) - Actran_ICFD: (1 license) - Actran_DirectSolver: (1 license) - Actran_IterativeSolver: (1 license) - Actran_KrylovSolver: (1 license) - Actran_MumpsSolver: (1 license) - Actran_ModalSolver: (1 license) - Actran_ModalAcoustic: (1 license) - Actran_NumericMode: (1 license) - Actran_VI: (1 license)	- Intake and exhaust noise, including complex mufflers and silencers. - Air conditioning units and distribution systems (calculation of transfer matrices coefficients). - Sound absorption inside passenger compartment of cars, trains and aircrafts. - Sound propagation in complex media with mean flow or temperature gradient. - Audio devices such as telephones, hearing aids or musical instruments.
9	**Wolfram Mathematica**	Computational software program used in many scientific, engineering, mathematical and computing fields, based on symbolic mathematics Features of Mathematica include: - Elementary mathematical function library - Special mathematical function library - Matrix and data manipulation tools including support for sparse arrays - Support for complex number, arbitrary precision, interval arithmetic and symbolic computation 2D and 3D data and function visualization and animation tools - Solvers for systems of equations, diophantine equations, ODEs, PDEs, DAEs, DDEs, SDEs and recurrence relations - Numeric and symbolic tools for discrete and continuous calculus - Multivariate statistics libraries including fitting, hypothesis testing, and probability and expectation calculations on over 100 distributions. - Support for censored data temporal data and unit based data - Calculations and simulations on random processes and queues - Constrained and unconstrained local and global optimization - Programming language supporting procedural, functional and object oriented constructs - Toolkit for adding user interfaces to calculations and applications - Tools for 2D and 3D image processing[7] and morphological image processing including image recognition - Tools for visualizing and analysing graphs - Tools for combinatoric problems - Tools for text mining including regular expressions and semantic analysis - Data mining tools such as cluster analysis, sequence alignment and pattern matching - Number theory function library - Tools for financial calculations including bonds, annuities, derivatives, options etc.

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		• Group theory and symbolic tensor functions • Libraries for signal processing including wavelet analysis on sounds, images and data • Control systems libraries • Continuous and discrete integral transforms • Import and export filters for data, images, video, sound, CAD, GIS,[8] document and biomedical formats • Database collection for mathematical, scientific, and socio-economic information and access to WolframAlpha data and computations • Technical word processing including formula editing and automated report generating • Tools for connecting to DLLs. SQL, Java, .NET, C++, Fortran, CUDA, OpenCL and http based systems • Tools for parallel programming • Using both "free-form linguistic input" (a natural language user interface) [9] and Mathematica language in notebook when connected to the Internet
10	**COMSOL** • COMSOL: (7 licenses) • COMSOLBATCH: (7 licenses) • ACDC: (1 license) • ACDCBATCH: (1 license) • ACOUSTICS: (2 licenses) • ACOUSTICSBATCH: (2 licenses) • CADIMPORT: (3 licenses) • CADIMPORTBATCH: (3 licenses) • CFD: (3 licenses) • CFDBATCH: (3 licenses) • FATIGUE: (1 license) • FATIGUEBATCH: (1 license) • HEATTRANSFER: (3 licenses) • HEATTRANSFERBATCH: (3 licenses) • LLEXCEL: (1 license) • LLEXCELBATCH: (1 license) • LLINVENTOR: (1 license) • LLMATLAB: (1 license) • LLMATLABBATCH: (1 license) • MATLIB: (2 licenses) • MATLIBBATCH: (2 licenses) • MEMS: (2 licenses) • MEMSBATCH: (2 licenses) • MICROFLUIDICS: (1 license)	Model and simulate any physics-based system Includes the COMSOL Desktop® graphical user interface (GUI) and a set of predefined user interfaces with associated modeling tools, referred to as physics interfaces, for modeling common applications. Any number of modules given below can be seamlessly combined to handle challenging multiphysics applications. • Electrical modules: (AC/DC, RF,Wave Optics, MEMS,Plasma,Semiconductor) • Mechanical modules : (Heat Transfer,Module Structural,Mechanics ,Nonlinear Structural Material ,Geomechanics, Fatigue, Multibody Dynamics, Acoustics) • Fluid modules: (CFD,Mixer,Microfluidics,Subsurface Flow,Pipe Flow,Molecular Flow) • Chemical modules: (Chemical Reaction,Engineering ,Batteries &Fuel Cells, Electrodeposition,Corrosion,Electrochemistry) • Multipurpose modules: (Optimization, Material,Library Particle Tracing) • Interfacing modules :

• MICROFLUIDICSBATCH: (1 license) • MULTIBODYDYNAMICS: (3 licenses) • MULTIBODYDYNAMICSBATCH: (3 licenses) • NONLINEARSTRUCTMATERIALS : (3 licenses) • NONLINEAR STRUCTMATERIALS BATCH: (3 licenses) • OPTIMIZATION: (1 license) • OPTIMIZATIONBATCH: (1 license) • PIPEFLOW: (1 license) • PIPEFLOWBATCH: (1 license) • RF: (1 license) • RFBATCH: (1 license) • STRUCTURALMECHANICS: (3 licenses) • STRUCTURAL MECHANICSBATCH: (3 licenses) • WAVEOPTICS: (1 license) • WAVEOPTICSBATCH: (1 license) • COMSOLGUI: (7 licenses) • CLIENTSERVER: (7 licenses) • CLUSTERNODE: (7 licenses) • CADREADER: (3 licenses) • CADREADERBATCH: (3 licenses)	(LiveLink™ for MATLAB® ,CAD Import Module, LiveLink™ for SolidWorks® , LiveLink™ for Inventor® , LiveLink™ for Creo™Parametric , LiveLink™ for Solid Edge® , LiveLink™ for Excel® ECAD Import, LiveLink™ for SpaceClaim®, LiveLink™ for AutoCAD®, LiveLink™ for Pro/ENGINEER® File Import for CATIA® V5)
11 CalVIEW	• CalVIEW is a LabVIEW-based calibration interface toolkit for efficiently communicating and calibrating data parameters (CalPoints) and faults (Fault Points) between a LabVIEW target and a Windows host via Ethernet. It provides a user-friendly implementation for real-time target programming and an interface console for pairing RT target parameters to a LabVIEW Windows host VI. Furthermore, CalVIEW supports ASAM MCD-2 (A2L) file generation and communication with devices over ASAM MCD-3MC (ASAP3).
12 Drivven Combustion Analysis Toolkit (DCAT)	• The Drivven Combustion Analysis Toolkit is a unique LabVIEW-based VI toolkit enabling users to integrate sophisticated combustion analysis and logging with engine control applications. The toolkit includes over 75 custom analysis functions, front panel controls and utilities including data streaming to disk, pre-processing, heat release and pressure metrics, summary data reporting and logging, post-processing, and knock and noise analysis. DCAT leverages R-Series (FPGA) and S-Series (simultaneous analog sampling)

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		cards from National Instruments to supervise engine position tracking and synchronization of data collection and processing.
13	**Autodesk Products** • Autodesk Navisworks Manage • Autodesk Showcase • Autodesk Mudbox • Autodesk Simulation Multiphysics • Autodesk AutoCAD • Autodesk 3ds Max Design • Autodesk Simulation Moldflow Adviser Ultimate • Autodesk SketchBook Designer • Autodesk Vault Professional Client • Autodesk 3ds Max • Autodesk Alias Automotive • Autodesk AutoCAD Electrical • Autodesk AutoCAD Raster Design • Autodesk Inventor Professional • Autodesk Maya • Autodesk MotionBuilder • Autodesk Revit • Autodesk Ecotect Analysis • Autodesk Alias Design • Autodesk AutoCAD Plant 3D • Autodesk AutoCAD Utility Design • Autodesk InfraWorks • Autodesk Quantity Takeoff • Autodesk Simulation CFD • Autodesk Simulation Mechanical • Autodesk SketchBook Pro for Enterprise • Autodesk Softimage • Autodesk Vault Basic Server • Autodesk AutoCAD Architecture • Autodesk AutoCAD Civil 3D • Autodesk AutoCAD Map 3D	• **Autodesk Navisworks Manage :** Helps architecture, engineering, and construction professionals holistically review integrated models and data with stakeholders to gain better control over project outcomes. • **Autodesk Showcase :** 3D presentation and 3D visualization software provides easy-to-use presentation and design exploration tools for architects, designers, engineers, and marketing professionals. • **Autodesk Mudbox:** Digital painting and digital sculpting software enables you to create production-ready 3D digital artwork. • **Autodesk Simulation Multiphysics : P**art of the Autodesk solution for Digital Prototyping, provides a range of mechanical simulation tools to help designers and engineers make decisions earlier in the engineering design process. • **Autodesk AutoCAD :** Design and shape the world around you with Autodesk® AutoCAD® software. Speed documentation, connect your workflow, and explore 3D concepts. It's time to take design further. • **Autodesk 3ds Max Design :** Provides a comprehensive 3D modeling, animation, and rendering solution used by architects, designers, civil engineers, and visualization specialists. • **Autodesk Simulation Moldflow Adviser Ultimate :** Provides simulation tools for injection mold design, plastic part design, and the injection molding design process. • **Autodesk SketchBook Designer :** Explore design concepts and produce stunning artwork with Autodesk® SketchBook® Designer illustration software. • **Autodesk Vault Professional Client :** Data management software helps organize, manage, and track data creation, simulation, and documentation processes for design, engineering, and construction teams. • **Autodesk 3ds Max:** Provides a comprehensive 3D modeling, animation, rendering, and compositing solution for games, film, and motion graphics artists. • **Autodesk Alias Automotive :** Iindustrial design software powers your creative process with a range of sketching, modeling, surfacing, and visualization tools. Create compelling designs with tools tailored for industrial design, automotive design, and technical surfacing. • **Autodesk AutoCAD Electrical :** for electrical controls designers. • **Autodesk AutoCAD Raster Design :**With powerful raster editing and raster-to-vector conversion tools, it helps you easily edit, enhance, and maintain scanned drawings and plans in a familiar Autodesk® AutoCAD® environment. • **Autodesk Inventor Professional :**Offers an easy-to-use set of tools for 3D mechanical design, documentation, and product simulation. • **Autodesk Maya :** Animation software offers a comprehensive creative feature set for 3D computer animation, modeling, simulation, rendering, and compositing on a highly extensible production platform.

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- Autodesk AutoCAD Mechanical
- Autodesk AutoCAD MEP
- Autodesk AutoCAD Structural Detailing
- Autodesk Revit Architecture
- Autodesk Revit MEP
- Autodesk Revit Structure
- Autodesk Robot Structural Analysis Professional

- **Autodesk MotionBuilder :** 3D character animation software for virtual production enables you to more efficiently manipulate and refine data with greater reliability.
- **Autodesk Revit :** Specifically built for Building Information Modeling (BIM), empowering design and construction professionals to bring ideas from concept to construction with a coordinated and consistent model-based approach.Autodesk® Revit® 2014 now includes the functionality of all the Revit disciplines (Architecture, MEP, and Structure) in one unified interface.
- **Autodesk Ecotect Analysis:** Comprehensive, concept-to-detail sustainable design analysis tool, providing a wide range of simulation and analysis functionality through desktop and web-service* platforms.
- **Autodesk Alias Design :** Industrial design software powers your creative process with a range of sketching, modeling, surfacing, and visualization tools. Create compelling designs with tools tailored for industrial design, automotive design, and technical surfacing.
- **Autodesk AutoCAD Plant 3D :** Design, model, and document process plants with AutoCAD® Plant 3D software. AutoCAD Plant 3D brings advanced 3D design to plant designers and engineers, helping to improve productivity, accuracy, and project coordination.
- **Autodesk AutoCAD Utility Design :** Utility Design software combines design and documentation with rules-driven workflows and analysis for electrical distribution design.
- **Autodesk InfraWorks :** Quickly and easily create civil infrastructure design models with Autodesk® InfraWorks software (formerly Autodesk® Infrastructure Modeler).
- **Autodesk Quantity Takeoff :** Building cost estimating software helps make material costing faster, easier, and more accurate.
- **Autodesk Simulation CFD :** Fast, accurate, and flexible fluid flow and thermal simulation tools to help predict product performance, optimize designs, and validate product behavior before manufacturing.
- **Autodesk Simulation Mechanical :** Optimize and validate your design before you build it with Autodesk Simulation software.
- **Autodesk SketchBook Pro for Enterprise:**Professional-grade painting app that is easy to use for every artist. This intuitive sketching and painting software can transform your computer into a complete toolkit for professional artists, illustrators, and designers.
- **Autodesk Softimage :** Character animation software offers high-performance creative tools for artists and technical directors working in 3D game development, and visual effects.
- **Autodesk Vault Basic Server :** Offers fundamental data management capabilities and is included with many Autodesk® design applications such as AutoCAD®, Autodesk Inventor, and Autodesk® 3ds Max software. From here, download Autodesk Vault Basic (Server) and then install the software on a server.
- **Autodesk AutoCAD Architecture :** Architectural drafting and documentation is more efficient with the software's intuitive environment and tools specifically for architects.
- **Autodesk AutoCAD Civil 3D :** Engineering design and documentation solution that supports Building Information Modeling (BIM) workflows.

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- **Autodesk AutoCAD Map 3D :** Model-based infrastructure planning and management software, provides broad access to CAD and GIS data, helping users to make more-informed planning, design and management decisions
- **Autodesk AutoCAD Mechanical :** Mechanical design and drafting software is AutoCAD® software for manufacturing.
- **Autodesk AutoCAD MEP :** Discipline-specific version of AutoCAD® software for mechanical, electrical, and plumbing (MEP) designers and drafters that facilitates greater drafting productivity.
- **Autodesk AutoCAD Structural Detailing :** Helps structural engineers, detailers and fabricators create more precise detailing and fabrication shop drawings.
- **Autodesk Revit Architecture :** Capture and analyze design concepts, and accurately maintain coordinated design data through documentation and construction.
- **Autodesk Revit MEP :** BIM solution for mechanical, electrical, and plumbing engineers. It provides an integrated design, analysis, and documentation tool to support building systems projects from concept through construction
- **Autodesk Revit Structure :** Purpose-built building information modeling (BIM) solution for structural engineering firms, providing specific tools for structural design and analysis.
- **Autodesk Robot Structural Analysis Professional :** Provides structural engineers with advanced building simulation and analysis capabilities for large, complex structures.