



# Ansys Structures

## Capabilities Chart (Version 2023 R1)

- – Full Support
- ▲ – Limited Capability
- – Requires More than 1 Product



**STRUCTURES**

### / STRUCTURES

	MECHANICAL ENTERPRISE	MECHANICAL PREMIUM	MECHANICAL PRO	AUTODYN	LS-DYNA	SHERLOCK	MOTION	FORMING PRO
<b>VIBRATIONS</b>								
Modal	●	●	●		●	●	●	
Modal - Pre-Stressed	●	●	●		●		●	
Modal - Damped/UnSymmetric	●	●						
Transient - Mode-Superposition	●	●			●	●	●	
Harmonic - Mode-Superposition	●	●			●	●		
Harmonic - Full	●	●			▲			
Spectrum	●	●			●			
Random Vibration	●	●			●	●		
Mistuning	●	●						
Multi-Stage Cyclic Symmetry	●							
Rotordynamics	●	●			●			
<b>ACOUSTICS</b>								
Modal Acoustics	●							
Harmonic Acoustics	●				●			
Transient Acoustics	●				●			
Boundary Element Method Acoustics					●			
Spectral Element Method Acoustics					●			
Statistical Energy Analysis Acoustics					●			
Piezoelectric Acoustics	●							
Generation of Acoustic Signature from Contact Regions	●				●		●	

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Acoustics Element Library	●	●			●		●	
Acoustics Material Models	●	●			●			
<b>WAVE HYDRODYNAMICS</b>								
Diffraction and Radiation	●							
Frequency & Time Domain Motions Analysis	●							
Moorings, Joints & Tethers	●							
Internal Tanks	●							
Load Transfer to Structural Analysis	●							
<b>ADDITIONAL PHYSICS</b>								
1-D Thermal-Flow	●	●	●		●			
1-D Coupled-Field Circuits	●							
1-D Electromechanical Transducer	●							
MEMS ROM	●							
Piezoelectric	●				●			
Piezoresistive	●							
Electromagnetic	●							
Electro-Migration	●					●		
Diffusion-Pore-Fluid	●							
Diffusion-Thermal-Electric-Magnetic	●							
1-Way Fluid Structure Interaction	■2	■2	■2					
2-Way Fluid-Structure Interaction	■2			●	●			
Incompressible Fluid Dynamics (ICFD)					●			
Arbitrary Lagrangian Eulerian Method (ALE)					●			
Electromagnetics (EM)-Boundary Element Method (BEM)					●			
Multi-scale Modeling	●				●			
Conservation Element/Solution Element (CESE)					●			
<b>COMPOSITE MATERIALS</b>								
Material Definitions	●	●		●	●	●	●	
Ply Definitions	●	▲		●	●	●		

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	MECHANICAL ENTERPRISE	MECHANICAL PREMIUM	MECHANICAL PRO	AUTODYN	LS-DYNA	SHERLOCK	MOTION	FORMING PRO
Interface Layers	●				●			
Advanced Ply-Modeling Features	●							
Variable Material Data	●				▲			
Solid Extrusion	●				●			
Lay-Up Mapping	●							
Draping	●				●			
Lay-Up Exchange Interfaces	●							
Advanced Failure Criteria Library	●				▲			
First-Ply Failure	●	●			●			
Last-Ply failure	●				●			
Delamination	●				●			
Composite Cure Simulation	■9				▲			
Sandwich Modeling	●				●			
Automation / Run Scripts	●				●			
Short Fiber Composites	●				●			
<b>DURABILITY</b>								
Stress-Life (SN)	●	●	●		●		●	
Strain-Life (EN)	●	●	●		●		●	
Dang Van	■1	■1	■1		■1			
Safety Factor	●	●	●		●		●	
Adhesive Bond	■1	■1	■1		■1			
Crack Growth Linear Fracture Mechanics	■1	■1	■1		■1			
Seam Weld	■1	■1	■1		■1			
Spot Weld	■1	■1	■1		■1			
Thermo-Mechanical Fatigue	■1	■1	■1		■1	▲		
Vibration Fatigue	■1	■1	■1		■1	●	●	
Virtual Strain Gauge Correlation	■1	■1	■1		■1			
Python Scripting Customization	■1	■1	■1		■1	▲		
<b>EXPLICIT DYNAMICS</b>								

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	MECHANICAL ENTERPRISE	MECHANICAL PREMIUM	MECHANICAL PRO	AUTODYN	LS-DYNA	SHERLOCK	MOTION	FORMING PRO
FE (Lagrange) Solver	●			●	●			
Euler Solvers				●	●			
Implicit-Explicit Material States	●			●	●			
Mass Scaling	●			●	●			
Natural Fragmentation	●			●	●			
Erosion Based on Multiple Criteria	●			●	●			
De-Zoning				●	●			
Part Activation and Deactivation (Multi Stage Analysis)				●	●			
Explicit Time Integration	●			●	●			
<b>IMPLICIT DYNAMICS</b>								
Implicit Time Integration	●	●			●	●	●	
<b>GEOMETRIC IDEALIZATION</b>								
Spring	●	●	▲	●	●		●	
Mass	●	●	●	●	●		●	
Damper	●	●		●	●		●	
Spar	●	●	●		●			
Beam	●	●	●	●	●		●	
Cable	●	●	●		●			
Pipe/Elbow	●	●	●					
Shell - Thin	●	●	●	●	●		●	
Layered Shell -Thin (Composite)	●	●		●	●			
Shell - Thick (Solid Shell)	●	●	●		●	●		
Layered Shell - Thick (Solid Shell) (Composite)	●	●	●		●			
2D Plane / Axisymmetric	●	●	●		●		●	
3D Solids	●	●	●		●	●	●	
Layered 3D Solids (Composite)	●	●			●			
Infinite Domain	●	●	●	●	●		●	
2.5D Elements	●	●						
Reinforcement Elements	●	●		●	●	■		

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Coupled Field ROM Element Technology	●	●						
Iso-Geometric Analysis (IGA)					●			
<b>GEOMETRY AND STL FILE HANDLING</b>								
SpaceClaim Direct Modeler	●							
<b>HPC - STRUCTURES</b>								
Default Number of Cores	4 cores (DMP or SMP) MAPDL, 4 for Explicit, 4 for RBD, 4 for AQWA	4 cores (DMP or SMP) MAPDL, 4 for RBD	4 cores (DMP or SMP)	4 cores	1 core	Default Number of cores based on machine being used	4 core	4 cores
Parallel Solving on Local PC and Cluster	●	●	●	●	●	●	●	▲
MAPDL GPU Offload Acceleration	■6	■6	■6					
Ansys Cloud Support	MAPDL - Yes Explicit - No RBD - No AQWA - No	MAPDL - Yes RBD - No	MAPDL - Yes		●	▲		
Hybrid Parallel	●	●	●					
<b>MATERIALS</b>								
Basic Linear Materials (Linear, Anisotropic, Temperature Dependent)	●	●	●	●	●	●	●	
Basic Nonlinear Materials (Hyperelastic, Plasticity, Rate Independent, Isotropic, Concrete, Viscoelasticity)	●	●	▲	●	●		●	
Advanced Nonlinear Materials (Rate dependent, Anisotropic, Damage Models, Geomaterials, Multiphysics, Acoustics)	●			●	●			
Specialty Materials (Glass, Foam, Kevlar, Fabric, Biomechanic, Paper, Cardboard)					●		●	
Field Dependent	●	●		●				
Reactive Materials (Equations of State, High Explosives, Propellants)				●	●			
User Defined Materials	●			●	●	●	●	
Fracture Mechanics and Crack Growth	●				▲			
Materials Multiscale Homogenization	●				●			
Materials Database	■7	■7	■7	■7	■7	●	■7	
<b>MISCELLANEOUS AND USABILITY</b>								
Ansys SpaceClaim	●	■4	■4	■4	■4		■4	
Ansys Customization Suite (ACS)	●							
Support ACT Extensions	●	●	●	●	●			

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	MECHANICAL ENTERPRISE	MECHANICAL PREMIUM	MECHANICAL PRO	AUTODYN	LS-DYNA	SHERLOCK	MOTION	FORMING PRO
Journaling and Scripting	●	●	●		●	●	▲	
Command Snippet Support	●	●	●					
Batch run capability	●	●	●	●	●	●	●	
Read/Write 3rd Party Matrix CAE Data	●	●		●	●		●	
CDB and 3rd party FE Model Import	●	●	●		●		●	
Nastran Bulk File Export	●	●	●			●		
Direct Input of Nastran Bulk Data Files					●			
Pre-stressing from Nastran Linear Solution					●			
Global/Selective Mass Scaling	●			●	●			
Keyword Input	●	●	●		●			
Splitting of Input File into Subfiles	●	●	●		●			
User Subroutines	●			●	●		●	
Re-mapping	●			●	●			
Transmitting boundaries	●			●	●			
Dynamic Storage Allocation	●	●	●		●			
Extensive Output Data Controls (ascii/binary)	●	●	●		●			
Sense Switch Controls - Monitor Simulations Status	▲	▲	▲		●			
Interactive Real-Time Graphics	●	●	●	●	●			
Double Precision	●	●	●	●	●		●	
<b>MODELING CAPABILITIES</b>								
Contact - Linear	●	●	●	●	●		●	
Contact - Nonlinear	●	●	●	●	●		●	
Joints	●	●	●	●	●		●	
Seam Welds	●	●	●	●	●		●	
Spot Welds	●	●	●	●	●		●	
Element Birth and Death	●	●			●		●	
Gasket Elements	●				●			
Rezoning and Adaptive Remeshing	●				●			
Inverse Analysis	●							

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<b>MULTI ANALYSIS</b>								
Submodeling	●	●	●		●	▲		
Data Mapping	●	●	●		●		●	
Multiphysics Data Mapping	●	●	▲			▲	●	
Initial State	●	●		●	●		●	
Advanced Multi-Stage 2-D to 3-D Analysis	●	●						
<b>NONLINEAR MULTI-BODY DYNAMICS</b>								
Rigid Body Mechanisms	●	●			●		●	
Rigid Body Dynamics with CMS Components for Flexible Bodies	●						●	
Full Transient	●	●		●	●		●	
CMS with Substructuring	●						●	
Mixed Rigid - Flexible Systems	●	●	●	●	●		●	
Function Expression					●		●	
Drivetrain Creation							●	
Links							●	
Vehicle Dynamics					●		●	
<b>OPTIMIZATION</b>								
DesignXplorer included	●	●	●	■3	■3			
Parameters	●	●	●	●	●	▲	●	
Design Point Studies	●	●	●	●	●		●	
Correlation Analysis	●	●	●	●				
Design of Experiments	●	●	●	●			●	
Sensitivity Analysis	●	●	●	●				
Goal Drive Optimization	●	●	●	●				
Six Sigma Analysis	●	●	●	●				
<b>STRUCTURAL SOLVER CAPABILITIES</b>								
Linear Static	●	●	●		●	●	●	
Nonlinear Static	●	●	●		●		●	
Pre-Stress Effect, Linear Perturbation	●	●	●	▲	▲		●	

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Nonlinear Geometry	●	●	●	●	●		●	
Buckling - Linear Eigenvalue	●	●	●		●		●	
Buckling - Nonlinear Post Buckling Behavior	●	●	●		●			
Buckling - Nonlinear Post Buckling Behavior - Arc Length	●	●			●			
Steady State Analysis Applied to a Transient Condition	●				●			
Advanced Wave Loading	●							
<b>THERMAL</b>								
Steady State Thermal	●	●	●		●	▲		
Transient Thermal	●	●	●		●		●	
Conduction	●	●	●	●	●	●	●	
Convection	●	●	●		●			
Radiation to Space	●	●	●		●			
Radiation - Surface to Surface	●	●	●		●			
Phase Change	●	●	●	●	●			
Thermal Analysis of Layered Shells and Solids	●	●	●		●			
<b>TOPOLOGY AND LATTICE OPTIMIZATION</b>								
Structural Optimization	●	●	●					
Modal Optimization	●	●	●					
Thermal Loads	●	●	●					
Inertial Loads	●	●	●					
Optimized Design Validation	●	●	●					
Manufacturing Constraints	●	●	●					
Stress Constraints	●	●	●					
Symmetry	●	●	●					
Lattice Optimization	■8							
Overhang/Additive Constraints	■8							
<b>PARTICLE METHODS</b>								
Smooth Particle Hydrodynamics (SPH)				●	●			
Smooth Particle Galerkin (SPG)					●			

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Corpuscular Particle Method (CPM)					●			
Discrete Element Method (DEM)					●			
<b>AUTOMOTIVE</b>								
Seat-belts-including modeling of accelerometer, pretensioner, retractor, sensor, and slip ring					●			
Inflator Models					●			
Airbag Fabric Constitutive Models					●			
Accelerometers					●			
Airbag Sensors					●			
Airbag Breakout					●			
Eulerian Deployment of Airbags					●			
Airbag Folder					●			
Unfolded Reference Geometry for Airbags					●			
Dummy Positioner					●			
Side-Impact Dummy Special Damper					●			
Airbag Deployment					●			
<b>METAL STAMPING</b>								
Multi-Stage Forming Process Validation								●
Material Data Library and Management								●
Process Definition								●
Tool Setup and Preview								●
Drawbead Definition								●
Multiple Lancing Operation								●
Stamping Specific Post Processing (FLD, Formability Index, Wrinkling, Skidmark)								●

1 = Ansys nCode DesignLife Products	6 = Ansys HPC, ANSYS HPC Pack or Ansys HPC Workgroup	SMP = Shared-memory parallel
2 = Ansys Fluent	7 = Ansys Granta Materials Data for Simulation	MAPDL = Mechanical APDL
3 = Ansys DesignXplorer	8 = Ansys Additive Suite	Explicit = Autodyn
4 = Ansys SpaceClaim	9 = Ansys Composite Cure Simulation	RBD = Rigid Body Dynamics
5 = Ansys Customization Suite (ACS)	DMP = Distributed-memory parallel	Aqwa = Aqwa

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