



Realize Your Product Promise®

2019 R3

C A P A B I L I T I E S

STRUCTURES	MECHANICAL ENTERPRISE	MECHANICAL PREMIUM	MECHANICAL PRO	AUTODYN	LS-DYNA	AIM
GEOMETRIC IDEALIZATION						
Spring	●	●	▲	●	●	●
Mass	●	●	●	●	●	●
Damper	●	●		●	●	
Spar	●	●	●			
Beam	●	●	●	●	●	●
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	●	●				
Reinforced	●	●		●	●	
Coupled Field ROM Element Technology	●					
Substructuring / Matrix	●					

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STRUCTURES	MECHANICAL ENTERPRISE	MECHANICAL PREMIUM	MECHANICAL PRO	AUTODYN	LS-DYNA	AIM
MODELING CAPABILITIES						
Contact - Linear	●	●	●	●	●	●
Contact - Nonlinear	●	●	●	●	●	●
Joints	●	●	●	●	●	●
Spot Welds	●	●	●	●	●	
Element Birth and Death	●	●				
Gasket Elements	●					
Rezoning and Adaptive Remeshing	●			●	●	
Inverse Analysis	●					
MATERIALS						
Basic Linear Materials (Linear, Anisotropic, Temperature Dependent)	●	●	●	●	●	●
Basic Nonlinear Materials (Hyper, Plasticity, Rate Independent, Isotropic, Concrete)	●	●	▲	●	●	▲
Advanced Nonlinear Materials (Rate dependent, Anisotropic, Damage Models, Geomechanics Materials, Multiphysics)	●			●	●	
Field Dependent	●	●		●		
Reactive Materials	●					
Fracture Mechanics and Crack Growth	●					
Material Designer	●					
GRANTA Materials Data for Simulation	■ ⁷	■ ⁷	■ ⁷			

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COMPOSITE MATERIALS						
Material Definitions	●	●		●	●	
Layers Definitions	●	▲		●	●	
Interface Plies	●					
Advanced 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					
STRUCTURAL SOLVER CAPABILITIES						
Linear Static	●	●	●			●
Nonlinear Static	●	●	●			●
Pre-Stress Effects, Linear Perturbation	●	●	●	▲	▲	
Nonlinear Geometry	●	●	●	●	●	●

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STRUCTURAL SOLVER CAPABILITIES (CONTINUED)						
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	●					
TOPOLOGY OPTIMIZATION						
Structural Optimization	●	●	●			●
Modal Optimization	●	●	●			●
Thermal Loads	●	●	●			
Inertial Loads	●	●	●			
Optimized Design Validation	●	●	●			●
Manufacturing Constraints	●	●	●			▲
Stress constraints	●	●	●			●
Symmetry	●	●	●			●
Lattice Optimization	■ ⁸					
Overhang/Additive Constraints	■ ⁸					

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MULTI ANALYSIS						
Submodeling	●	●	●			
Data Mapping	●	●	●			●
Multiphysics Data Mapping	●	●				
Initial State	●	●		●	●	
Advanced Multi-Stage 2-D to 3-D Analysis	●	●				
VIBRATIONS						
Modal	●	●	●			●
Modal - Pre-Stressed	●	●	●			●
Modal - Damped/ Unsymmetric	●	●				
Transient - Mode-Superposition	●	●				
Harmonic - Mode-Superposition	●	●				
Harmonic - Full	●	●				
Spectrum	●	●				
Random Vibration	●	●				●
Mistuning	●	●				
Rotordynamics	●	●				
Modal Acoustic	●					
Harmonic Acoustic	●					

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NONLINEAR TRANSIENT DYNAMICS						
Rigid Body Mechanisms	●	●				
Rigid Body Dynamics with CMS L Components for Flexible Bodies	●					
Full Transient	●	●		●	●	
CMS with Substructuring	●					
EXPLICIT DYNAMICS						
FE (Lagrange) Solver	●			●	●	
Euler Solvers				●		
Meshless Solvers	●			●		
Implicit-Explicit Deformations	●			●	●	
Implicit-Explicit Material States	●			●		
Fluid-Structure Interaction (FSI)	●			●		
Mass Scaling	●			●	●	
Natural Fragmentation	●			●		
Erosion Based on Multiple Criteria	●			●	●	
De-Zoning				●	●	
Part Activation and Deactivation (Multi Stage Analysis)				●		
Remapping in Space				●		
Remapping Solution Methods				●		

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DURABILITY						
Stress-Life (SN)	●	●	●			●
Strain-Life (EN)	●	●	●			●
Dang Van	■ ¹	■ ¹	■ ¹			
Safety Factor	●	●	●			●
Adhesive Bond	■ ¹	■ ¹	■ ¹			
Crack Growth Linear Fracture Mechanics	■ ¹	■ ¹	■ ¹			
Seam Weld	■ ¹	■ ¹	■ ¹			
Spot Weld	■ ¹	■ ¹	■ ¹			
Thermo-Mechanical Fatigue	■ ¹	■ ¹	■ ¹			
Vibration Fatigue	■ ¹	■ ¹	■ ¹			
Virtual Strain Gauge Correlation	■ ¹	■ ¹	■ ¹			
Python Scripting Customization	■ ¹	■ ¹	■ ¹			
WAVE HYDRODYNAMICS						
Diffraction and Radiation	●					
Frequency & Time Domain Motions Analysis	●					
Moorings, Joints & Tethers	●					
Load Transfer to Structural Analysis	●					

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THERMAL						
Steady State Thermal	●	●	●			●
Transient Thermal	●	●	●			●
Conduction	●	●	●	●	●	●
Convection	●	●	●			●
Radiation to Space	●	●	●			●
Radiation - Surface to Surface	●	●	●			
Phase Change	●	●	●	●	●	
Thermal Analysis of Layered Shells and Solids	●	●	●			
ADDITIONAL PHYSICS						
1-D Thermal-Flow	●	●	●			
1-D Coupled-Field Circuits	●					
1-D Electromechanical Transducer	●					
MEMS ROM	●					
Piezoelectric	●					
Piezoresistive	●					
Electroelastic	●					
Electromagnetic	●					▲
Vibro-Acoustics	●					
Electro-Migration	●					

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ADDITIONAL PHYSICS (CONTINUED)						
Diffusion-Pore-Fluid	●					
Diffusion-Thermal Structural-Electric	●					
Structural-Thermal-Electric-Magnetic	●					▲
1-Way Fluid-Structure Interaction	■ ²	■ ²	■ ²			●
2-Way Fluid-Structure Interaction	■ ²					
OPTIMIZATION						
DesignXplorer Included	●	●	●	■ ³	■ ³	●
Parameters	●	●	●	●	●	●
Design Point Studies	●	●	●	●	●	●
Correlation Analysis	●	●	●	●		●
Design of Experiments	●	●	●	●		●
Sensitivity Analysis	●	●	●	●		●
Goal Driven Optimization	●	●	●	●		●
Six Sigma Analysis	●	●	●	●		●
MISCELLANEOUS AND USABILITY						
ANSYS SpaceClaim	●	■ ⁴	■ ⁴	■ ⁴	■ ⁴	●
ANSYS Customization Suite (ACS)	●	■ ⁵	■ ⁵	■ ⁵	■ ⁵	●
Support ACT Extensions	●	●	●	●	●	●
Command Snippet Support	●	●	●			●

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MISCELLANEOUS AND USABILITY (CONTINUED)						
Batch run capability	●	●	●	●	●	
Read/Write 3rd Party Matrix CAE Data	●	●		●	●	
CDB and 3rd party FE Model Import	●	●	●		●	
Nastran Bulk File Export	●	●	●			
HPC - STRUCTURES						
Default Number of Cores	4 (DMP + SMP) MAPDL 4 for Explicit 4 for RBD MAPDL 4 for AQWA	4 (DMP + SMP)	4 (DMP + SMP)	1	1	4 (DMP + SMP) MAPDL
Parallel Solving on Local PC	●	●	●	●	●	●
Parallel Solving on Cluster	●	●	●	●	●	
GPU Acceleration	MAPDL - ■ ⁶ Explicit - No RBD - No AQWA - No	■ ⁶	■ ⁶			
Parallel Solving with ANSYS Cloud Launched from Desktop	MAPDL - Yes Explicit - No RBD - No AQWA - No	MAPDL - Yes RBD - No	MAPDL - Yes			

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