

ANSYS 15.0 Capabilities Brochure

ANSYS®



FLUIDS

STRUCTURES

ELECTRONICS

SYSTEMS

**ANSYS® 15.0
Capabilities Chart**

	ANSYS Multiphysics™	ANSYS Mechanical™	ANSYS Structural™	ANSYS Professional™ NLS	ANSYS Professional NLT	ANSYS DesignSpace®	ANSYS Explicit STR™	ANSYS Autodyn®	ANSYS LS-DYNA®	ANSYS CFD™		ANSYS CFD-Flo™	ANSYS CFD Professional	ANSYS Polyflow®	ANSYS HFSS™	ANSYS Maxwell®
										ANSYS Fluent®	ANSYS CFX®					
Structural Analysis																
Analysis Types																
Static	•	•	•	•	•	•										
Modal	•	•	•	•	•	•										
Buckling (linear)	•	•	•	•	•	•										
Buckling (nonlinear)	•	•	•	•			•	•	•							
Transient	•	•	•	Δ	Δ		•	•	•							
Spectrum	•	•	•	•	•											
Harmonic	•	•	•	Δ	Δ											
Random vibration	•	•	•													
Substructuring	•	•	•													
Geometric Nonlinearity																
Large strain	•	•	•	•			•	•	•							
Large deflection	•	•	•	•	Δ		•	•	•							
Material Model Highlights																
Linear material models	•	•	•	•	•	•	•	•	•							
Rate-dependent plasticity	•	•	•				•	•	•							
Rate-independent plasticity	•	•	•	Δ			•	•	•							
Hyperelasticity	•	•	•	Δ			•	•	•							
Viscoelasticity	•	•	•				•	•	•							
Creep	•	•	•													
Reactive materials							•	•								
Contact Modeling																
Bonded/no separation sliding	•	•	•	•	•	•	•	•	•							
Pretension (bolts, etc.)	•	•	•	•	•	•										
Joints	•	•	•	•	•											
Spot welds	•	•	•	•	•		•	•	•							
Nonlinear Contact Modeling																
Rough	•	•	•	•	•	Δ	•	•	•							
Frictionless	•	•	•	•	•	Δ	•	•	•							
Friction	•	•	•	•			•	•	•							
Gaskets	•	•	•													
Advanced Analysis																
Rotordynamics	•	•	•													
Component mode synthesis	•	•	•													
Cyclic symmetry analysis	•	•	•	•	•				•							
Rezoning	•	•	•					•								
Submodeling	•	•	•	•	•	•			•							
Element birth and death	•	•	•				Δ	Δ	Δ							

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Explicit Analysis																
Modeling Capabilities																
Interactive prep/post and solution								•								
Remapping in space								•								
Remapping solution methods								•								
Mass scaling							•	•	•							
Dezoning								•								
Part activation and deactivation								•								
Part addition/removal during a simulation								•								
Erosion based on multiple criteria							•	•	•							
Natural fragmentation							•	•								
Euler solver								•								
2-D solver							Δ	•								
Fluid-structure interaction (FSI)								•								
Implicit-explicit deformations							•	•	•							
Implicit-explicit material states							•	•								
Thermal Analysis																
Analysis Types																
Steady state	•	•		•	•	•					•	•	•	•	•	
Transient	•	•			•						•	•	•	•	•	
Thermal Modeling																
Conduction	•	•		•	•	•	•	•			•	•	•	•	•	
Convection	•	•		•	•	•					•	•	•	•	•	
Radiation	•	•			•						•	•	Δ		Δ	
Phase change	•	•			•		•	•	•		•	•				
Fluid Dynamics																
Modeling Capabilities																
Variety of inlet and outlet B.C.	•										•	•	•	•	•	
Steady-state flow	•										•	•	•	•	•	
Transient flow	•										•	•	•	•	•	
2-D flow (dedicated solver option)											•				•	
2-D flow (using thin 3-D segment)	•										•	•	•	•	•	
3-D flow	•										•	•	•	•	•	
Time-dependent boundary conditions	•										•	•	•	•	•	
Incompressible flow	•										•	•	•	•	•	
Compressible flow	•										•	•	•	•	•	
Natural convection	•										•	•	•	•	•	
Fan model	•										•	•	•	•	•	
Periodic domains	•										•	•	•	•	•	
Porous media	•										•	•	•	•	•	
Heat transfer	•										•	•	•	•	•	
Conjugate heat transfer	•										•	•	•	•	•	
Non-Newtonian viscosity	•										•	•	•	•	•	
Viscoelasticity														•		
Turbulence (isotropic)	•										•	•	•	Δ		

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Fluid Dynamics																
Modeling Capabilities (continued)																
Turbulence (anisotropic/RSM/LES)	•									•	•	•				
Turbulence (transitional/SAS/DES)										•	•					
Rotating equipment (MRF/frozen-rotor)										•	•					
Rotating equipment (sliding-mesh/stage)										•	•					
Dynamic/moving-deforming mesh	•									•	•	•		•		
Immersed-solid/MST method for moving parts	•									•	•	•		•		
Flow-driven solid motion (6DOF)										•	•	•				
Internal radiation (participating media)	•									•	•	•		•		
Internal radiation (transparent media)										•	•					
External radiation										•	•					
Solar radiation and load										•	•					
Species modeling	•									•	•	•		•		
Flow pathlines (massless)	•									•	•	•	•	•		
Particle tracking (with mass)										•	•					
Coupled discrete phase modeling										•	•					
Acoustics (source export)	•									•	•	•				
Acoustics (noise prediction)										•						
Chemical reaction										•	•			•		
Combustion										•	•					
Cavitation	•									•	•	•				
Multiphase (Eulerian)										•	•					
Multiphase (free surface)	•									•	•	•		•		
Fluid-structure interaction option	•									•	•	•	•	•		
Internal optimization for flow										•				•		
Specialty extrusion models														•		
Specialty blow molding models														•		
Specialty fiber spinning models										•						
Specialty fuel cell models										+						
Mesh Morphing										+						
Transient blade row models (turbo)											•					
Flutter/forced response											+					
Multiphase wall film (Eulerian)											•					
Solver Options																
Pressure-based coupled solver	•									•	•	•	•	•		
Density-based coupled solver										•						
Pressure-based segregated solver										•						
Parallel solving on local PC option	•							•	•	•	•	•	•	•		
Parallel solving over network option	•							•	•	•	•	•	•	•		
Customizable, scripting and user functions	•									•	•	•	•	•		
Adjoint solver for sensitivity analysis										•						

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Electromagnetics – Low Frequency															
Electrostatics	•														•
AC conduction	•														•
DC conduction	•														•
DC insulator field															•
Magnetostatics	•														•
Adaptive field mesh															•
AC harmonic magnetic	•														•
AC harmonic electric	•														•
Electric transient	•														•
Ion optics	•														•
Magnetic Transient															
Rigid motion visualization															•
Translational motion	•														•
Rotational motion	•														•
Double-layer rotational motion															•
Cylindrical motion															•
Automatic matching boundaries															•
Winding definition															•
Automatic coil connections across boundaries															•
Advanced circuit coupling with ANSYS Simplorer®															•
Circuit coupling with adaptive time stepping															•
Advanced Material Characteristics															
Nonlinear anisotropic materials															•
Functional magnetization direction															•
Advanced permanent magnet demagnetization modeling															•
Nonlinear magnetization characteristics															•
Core loss modeling															•
Automatic project creation using UDPs															•
Insulation sheet to model cracks															•
Electromagnetics – High Frequency															
Frequency domain analysis															•
Time domain analysis															•
Eigenmode analysis															•
Integral equation analysis															•
Hybrid finite element integral equation analysis															•
Wave port excitation															•
Lumped port excitation															•
Floquet excitations															•
Plane wave excitation															•

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Electromagnetics – High Frequency (continued)																
Hertzian dipole excitation																•
Cylindrical wave excitation																•
Gaussian beam excitation																•
Linear antenna excitation																•
Linked far-field excitation																•
Linked near-field excitation																•
Voltage source excitation																•
Current source excitation																•
Magnetic bias excitation																•
Modal solutions																•
Terminal solutions																•
Perfect electric conductor boundary																•
Perfect magnetic conductor boundary																•
Finite conductivity boundaries																•
Impedance boundary																•
Layered impedance boundary																•
RLC boundary																•
Radiation boundary																•
Symmetry boundary																•
Master/slave boundary																•
Screening impedance boundary																•
Perfectly matched layer boundary																•
Frequency-dependent materials																•
Field calculation inside conductive materials																•
Discrete-frequency sweep type																•
Fast-frequency sweep type																•
Interpolating sweep frequency sweep type																•
Zero-, first-, second- and mixed-order element types																•
True curvilinear mesh elements																•
Fully automated meshing																•
Fully automated adaptive mesh refinement																•
S, Y, Z matrix results																•
Propagation constant results																•
E, H, J, P field results																•
Field calculator																•
Iterative matrix solver																•
Direct matrix solver																•
Distributed frequency sweep solver capability																•
Distributed model solution capability																•

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Electromagnetics – High Frequency (continued)																
Antenna parameter calculation																•
Infinite antenna array calculation																•
Finite antenna array calculation																•
Radar cross section calculation																•
Frequency selective surface calculation																•
Metamaterial calculation																•
Specific absorption rate calculation																•
EMI/EMC calculation																•
Imported geometry healing																•
Fully scriptable																•
Link to ANSYS Mechanical																•
Dynamic link to Ansoft Designer®																•
Link to ANSYS SIwave™																•
Link to ANSYS Simplorer																•
Coupled Physics (Sometimes requires two or more products)																
Acoustics	•	•								•	Δ	Δ				
Acoustics–structural	•	•														
Electric–magnetic	•														•	•
Fluid–structural	•	•						•		•	•	•	•			
Fluid–thermal	•									•	•	•	•			
Electromagnetic–fluid	•									+	+	+	+			•
Electrostatic–structural	•															
Magnetic–structural	•															•
Electromagnetic–thermal	•														•	•
Piezoelectric	•	•														
Piezoresistive	•	•														
Thermal–electric	•	•														•
Thermal–structural	•	•		•	•	•	•	•								
Thermal–electric–structural	•	•														•
Thermal–electric–fluids										•						
Electromagnetic–thermal–structural	•														•	•
Electromagnetic–thermal–fluids										•						
Reduced-order modeling (ROM)	•	•														•
Pre-Processing																
Modeling Capabilities																
IGES/STEP geometry reader	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Beam modeling	•	•	•	•	•	+	•	•	•							
Composite lay-up		•	•	•	•		•	•								
Meshing Capabilities																
Defeaturing	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Surface meshing	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Tetrahedral meshing	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•

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Pre-Processing																
Meshing Capabilities (continued)																
Parallel meshing										•	•	•	•	•		
Prism inflation layers	•	•	•	•	•		•	•	•	•	•	•	•	•		
Swept-hex meshing	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
Thin-sweep meshing	•	•	•	•	•	•	•	•	•	•	•	•	•	•		
Multizone hex meshing	•	•	•	•	•		•	•	•	•	•	•	•	•		
Automatic hexa-core meshing	•	•	•	•	•		•	•	•	•	•	•	•	•		
Automatic hexa-dominant meshing	•	•	•	•	•		•	•	•	•	•	•	•	•		
Cut cell Cartesian meshing										•						
Curvilinear elements															•	•
Adaptive mesh refinement	•	•	•	•	•	•				•	•	•	•	•	•	•
Boundary Conditions																
Solid model loads and boundary conditions	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Tabular loads and boundary conditions	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Function loads and boundary conditions	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Apply temperature loads	•	•	•	•	•	•				•	•	•	•	•	•	•
Post-Processing																
Report generator	•	•	•	•	•	•	•	Δ	Δ	•	•	•	•	•	•	•
Contour displays	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Vector displays	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Isosurface displays	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Slicing planes	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Quantitative calculations	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•
Particle tracing	•									•		•		•		
Animation	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Output (images, Excel® data)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
CFD turbomachinery										•	•	•				
General																
ANSYS Engineering Knowledge Manager™ (EKM) data management ready	+	+	+	+	+	+	+	+	+	+	+	+	+	+		
Parallel solvers (HPC licenses required)	+	+	+	+	+			•	+	+	+	+	+	+	+	+
Solver scripting language	•	•	•	•	•				•	•	•	•	•	•	•	•
Parameter manager	•	•	•	•	•	•	•	Δ		•	•	•	•	•	•	•

Δ = Limited set of feature capabilities + = Additional product required

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