

**ANSYS 14.5 Capabilities Brochure**

**ANSYS**<sup>®</sup>



**Fluid Dynamics**

**Structural Mechanics**

**Electromagnetics**

**Systems & Multiphysics**

**ANSYS® 14.5  
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 Fluent®	ANSYS CFX®	ANSYS CFD-Flo™	ANSYS Polyflow®	ANSYS HFSS™	ANSYS Maxwell®	
<b>Structural Analysis</b>																
<b>Analysis Types</b>																
Static	•	•	•	•	•	•										
Modal	•	•	•	•	•	•										
Buckling (linear)	•	•	•	•	•	•										
Buckling (nonlinear)	•	•	•	•	•		•	•	•							
Transient	•	•	•	Δ	Δ		•	•	•							
Spectrum	•	•	•	•	•											
Harmonic	•	•	•	Δ	Δ											
Random vibration	•	•	•													
Substructuring	•	•	•													
<b>Geometric Nonlinearity</b>																
Large strain	•	•	•	•			•	•	•							
Large deflection	•	•	•	•	Δ		•	•	•							
<b>Material Model Highlights</b>																
Linear material models	•	•	•	•	•	•	•	•	•							
Rate-dependent plasticity	•	•	•				•	•	•							
Rate-independent plasticity	•	•	•	Δ			•	•	•							
Hyperelasticity	•	•	•	Δ			•	•	•							
Viscoelasticity	•	•	•				•	•	•							
Creep	•	•	•													
Reactive materials							•	•								
<b>Contact Modeling</b>																
Bonded/no separation sliding	•	•	•	•	•	•	•	•	•							
Pretension (bolts, etc.)	•	•	•	•	•	•										
Joints	•	•	•	•	•											
Spot welds	•	•	•	•	•		•	•	•							
<b>Nonlinear Contact Modeling</b>																
Rough	•	•	•	•	•	Δ	•	•	•							
Frictionless	•	•	•	•	•	Δ	•	•	•							
Friction	•	•	•	•			•	•	•							
Gaskets	•	•	•													
<b>Advanced Analysis</b>																
Rotordynamics	•	•	•													
Component mode synthesis	•	•	•													
Cyclic symmetry analysis	•	•	•	•	•				•							
Rezoning	•	•	•					•								
Submodeling	•	•	•	•	•				•							
Element birth and death	•	•	•				Δ	Δ	Δ							

**ANSYS 14.5  
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 Fluent®	ANSYS CFX®	ANSYS CFD-Flo™	ANSYS Polyflow®	ANSYS HFSS™	ANSYS Maxwell®	
<b>Explicit Analysis</b>																
<b>Modeling Capabilities</b>																
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							•	•								
<b>Thermal Analysis</b>																
<b>Analysis Types</b>																
Steady state	•	•		•	•	•				•	•	•	•			
Transient	•	•			•					•	•	•	•			
<b>Thermal Modeling</b>																
Conduction	•	•		•	•	•	•	•		•	•	•	•			
Convection	•	•		•	•	•				•	•	•	•			
Radiation	•	•			•					•	•	Δ	Δ			
Phase change	•	•			•		•	•	•	•	•					
<b>Fluid Dynamics</b>																
<b>Modeling Capabilities</b>																
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)	•									•	•	•				

ANSYS 14.5  
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 Polyflow®	ANSYS HFSS™	ANSYS Maxwell®
	ANSYS Fluent®	ANSYS CFX®													
<b>Fluid Dynamics</b>															
<b>Modeling Capabilities (continued)</b>															
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										+					
<b>Solver Options</b>															
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										•					

**ANSYS 14.5  
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 Fluent®	ANSYS CFX®	ANSYS CFD-Flo™	ANSYS Polyflow®	ANSYS HFSS™	ANSYS Maxwell®
<b>Electromagnetics – Low Frequency</b>															
Electrostatics	•														•
AC conduction	•														•
DC conduction	•														•
DC insulator field															•
Magnetostatics	•														•
Adaptive field mesh															•
AC harmonic magnetic	•														•
AC harmonic electric	•														•
Electric transient	•														•
Ion optics	•														•
<b>Magnetic Transient</b>															
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															•
<b>Advanced Material Characteristics</b>															
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															•
<b>Electromagnetics – High Frequency</b>															
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															•

**ANSYS 14.5  
Capabilities Chart**

	ANSYS Multiphysics™	ANSYS Mechanical™	ANSYS Structural™	ANSYS Professional™ NLS	ANSYS Professional MLT	ANSYS DesignSpace®	ANSYS Explicit STR™	ANSYS Autodyn®	ANSYS LS-DYNA®	ANSYS CFD™					
										ANSYS Fluent®	ANSYS CFX®	ANSYS CFD-Fllo™	ANSYS Polyflow®	ANSYS HFSS™	ANSYS Maxwell®
<b>Electromagnetics – High Frequency (continued)</b>															
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															•

**ANSYS 14.5  
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 Polyflow®	ANSYS HFSS™	ANSYS Maxwell®
										ANSYS Fluent®	ANSYS CFX®	ANSYS CFD-Fllo™		
<b>Electromagnetics – High Frequency (continued)</b>														
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														•
<b>Coupled Physics</b> (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)	•	•												•
<b>Pre-Processing</b>														
<b>Modeling Capabilities</b>														
IGES/STEP geometry reader	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Beam modeling	•	•	•	•	•	+	•	•	•					
Composite lay-up		•	•	•	•		•	•						
<b>Meshing Capabilities</b>														
Defeaturing	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Surface meshing	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Tetrahedral meshing	•	•	•	•	•	•	•	•	•	•	•	•	•	•

**ANSYS 14.5  
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 Polyflow®	ANSYS HFSS™	ANSYS Maxwell®
										ANSYS Fluent®	ANSYS CFX®				
<b>Pre-Processing</b>															
<b>Meshing Capabilities (continued)</b>															
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	•	•	•	•	•	•				•	•	•		•	•
<b>Boundary Conditions</b>															
Solid model loads and boundary conditions	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Tabular loads and boundary conditions	•	•	•	•	•		•	•	•	•	•	•	•	•	•
Function loads and boundary conditions	•	•	•	•	•		•	•	•	•	•	•	•	•	•
Apply temperature loads	•	•	•	•	•	•				•	•	•	•	•	•
<b>Post-Processing</b>															
Report generator	•	•	•	•	•	•	•	Δ	Δ	•	•	•	•	•	•
Contour displays	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Vector displays	•	•	•	•	•		•	•	•	•	•	•	•	•	•
Isosurface displays	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Slicing planes	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Quantitative calculations	•	•	•	•	•		•	•	•	•	•	•	•	•	•
Particle tracing	•									•	•	•	•	•	•
Animation	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Output (images, Excel® data)	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
CFD turbomachinery										•	•	•			
<b>General</b>															
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

**ANSYS, Inc.**  
www.ansys.com  
ansysinfo@ansys.com  
866.267.9724

ANSYS is dedicated exclusively to developing engineering simulation software that fosters rapid and innovative product design. Our technology enables you to predict with confidence that your product will thrive in the real world. For more than 40 years, customers in the most demanding markets have trusted our solutions to help ensure the integrity of their products and drive business success through innovation.

ANSYS and any and all ANSYS, Inc. brand, product, service and feature names, logos and slogans are registered trademarks or trademarks of ANSYS, Inc. or its subsidiaries in the United States and other countries. All other brand, product, service and feature names or trademarks are the property of their respective owners.