

ANSYS[®]

19.2

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

- = Fully Supported
- ▲ = Limited Capability
- = Requires more than 1 product

| | ANSYS Mechanical Enterprise | ANSYS Mechanical Premium | ANSYS Mechanical Pro | ANSYS Autodyn | ANSYS LS-DYNA | ANSYS AIM |
|--|-----------------------------|--------------------------|----------------------|---------------|---------------|-----------|
| STRUCTURES | | | | | | |
| 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 | ● | ● | | ● | ● | |
| ROM | ● | | | | | |
| Substructuring / Matrix | ● | | | | | |
| Modeling Capabilities | | | | | | |
| Contact - Linear | ● | ● | ● | ● | ● | ● |
| Contact - Nonlinear | ● | ● | ● | ● | ● | ● |
| Joints | ● | ● | ● | ● | ● | ● |
| Spot Welds | ● | ● | ● | ● | ● | |
| Element Birth and Death | ● | ● | | | | |
| Gasket Elements | ● | | | | | |
| Rezoning and Adaptive Remeshing | ● | | | ● | ● | |
| 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 | ● | | | | | |

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|---|-----------------------------|--------------------------|----------------------|---------------|---------------|-----------|
| Material Designer | ● | | | | | |
| Composite Materials | | | | | | |
| Material Definitions | ● | ● | | ● | ● | |
| Layers Definitions | ● | ▲ | | ● | ● | |
| Solid Extrusion | ● | | | | | |
| First-ply Failure | ● | ● | | | | |
| Last-Ply failure | ● | | | | | |
| Delamination | ● | | | ● | ● | |
| Draping | ● | | | | | |
| Structural Solver Capabilities | | | | | | |
| Linear Static | ● | ● | ● | | | ● |
| Nonlinear Static | ● | ● | ● | | | ● |
| Pre-Stress effects, Linear perturbation | ● | ● | ● | ▲ | ▲ | |
| 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 | ● | | | | | |
| Topology Optimization | | | | | | |
| Structural Optimization | ● | ● | ● | | | ● |
| Modal Optimization | ● | ● | ● | | | ● |
| Thermal Loads | ● | ● | ● | | | |
| Inertial Loads | ● | ● | ● | | | |
| Optimized Design Validation | ● | ● | ● | | | ● |
| Manufacturing Constraints | ● | ● | ● | | | ▲ |
| Stress Constraints | ● | ● | | | | ● |
| Symmetry | ● | ● | ● | | | ● |
| Lattice Optimization | □ | ● | ● | | | |
| Overhang/Additive Constraints | □ | ● | ● | | | |
| Multi Analysis | | | | | | |
| Submodeling | ● | ● | ● | | | |
| Data Mapping | ● | ● | ● | | | ● |
| Multiphysics Data Mapping | ● | ● | | | | |
| Initial State | ● | ● | | ● | ● | |

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| 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 | ● | | | | | |
| Nonlinear Transient Dynamics | | | | | | |
| Rigid Body Mechanisms | ● | ● | | | | |
| Rigid Body Dynamics with CMS 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 | | | | ● | | |
| Durability | | | | | | |
| Stress-Life (SN) | ● | ● | ● | | | ● |

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| 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 | ● | | | | | |
| 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 | ● | | | | | ▲ |

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| Electro-Migration | ● | | | | | |
| 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 | ● | ● | ● | | | ● |
| Batch run capability | ● | ● | ● | ● | ● | ● |
| External Code Interfaces | ● | ● | | ● | ● | |
| On the fly post processing | ● | ● | ● | | ● | |
| CDB and 3rd party FE Model Import | ● | ● | ● | | ● | |
| HPC - Structures | | | | | | |
| Supported Number of Cores | 4 (DMP + SMP) MAPDL 4 for Explicit 4 for RBD 4 for AQWA | 4 (DMP + SMP) | 4 (DMP + SMP) | 4 | 1 | 4 (DMP + SMP) MAPDL |
| Parallel Solving on Local PC | ● | ● | ● | ● | ● | ● |
| Parallel Solving on Cluster | ● | ● | ● | ● | ● | |

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| GPU Acceleration | □ ⁶ MAPDL - Yes Explicit - No RBD - No Aqwa - No | □ ⁶ | □ ⁶ | | | |

- 1 = ANSYS nCode DesignLife Products
- 2 = ANSYS Fluent
- 3 = ANSYS DesignXplorer
- 4 = ANSYS SpaceClaim
- 5 = ANSYS Customization Suite (ACS)
- 6 = ANSYS HPC, ANSYS HPC Pack or ANSYS HPC Workgroup

- DMP = Distributed-memory parallel
- SMP = Shared-memory parallel
- MAPDL = Mechanical APDL
- Explicit = Autodyn
- RBD = Rigid Body Dynamics
- Aqwa = Aqwa

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| | ANSYS FLUENT | ANSYS CFX | | | | | |
| FLUIDS | | | | | | | |
| General Solver Capabilities | | | | | | | |
| Comprehensive Inlet and Outlet Conditions | ● | ● | ● | ● | ● | ● | ● |
| Steady-State Flow | ● | ● | ● | ● | ● | ● | ● |
| Transient Flow | ● | ● | ● | ● | ● | ● | ● |
| 2-D and 3-D Flow | ● | ▲ | ● | ▲ | ● | ▲ | ▲ |
| Reduced Order Models (ROM) | ● | | | | | | |
| Time Dependent Boundary Conditions | ● | ● | ● | ● | ● | ▲ | ● |
| Customizable Materials Library | ● | ● | ● | ● | ● | ● | ● |
| Fan Model | ● | ● | | | ● | | ● |
| Periodic domains | ● | ● | ● | ● | ● | ● | ● |
| Flow-driven solid motion (6DOF) | ● | ● | | | ● | | |
| Pressure-based coupled solver | ● | ● | ● | ● | ● | ● | ● |
| Density-based coupled solver | ● | | | | | | ● |
| Dynamic/moving-deforming mesh | ● | ● | ● | ● | ● | | ● |
| Overset Mesh | ● | | | | | | |
| Immersed-solid/MST method for moving parts | | ● | ● | | ● | | |
| Automatic on-the-fly mesh generation with dynamic refinement | ● | | | ● | | | ● |
| Dynamic Solution-Adaptive Mesh refinement | ● | ● | | ● | ▲ | | ● |
| Polyhedral unstructured solution-adaptive mesh refinement | ● | | | | | | |
| | | | | | | | |
| Single Phase, non reacting flows | | | | | | | |
| Incompressible Flow | ● | ● | ● | | | ● | ● |
| Compressible Flow | ● | ● | | ● | ● | ● | ● |
| Porous Media | ● | ● | ● | | | ● | ● |
| Non-Newtonian Viscosity | ● | ● | ● | | | ● | |
| Turbulence - Isotropic | ● | ● | ● | ● | ● | ● | ● |
| Turbulence - Anisotropic (RSM) | ● | ● | | | | | |
| Turbulence - Unsteady (LES/SAS/DES) | ● | ● | | | | | |
| Turbulence - Laminar/Turbulent Transition | ● | ● | | | ● | ● | |
| Flow Pathlines (Massless) | ● | ● | ● | | | ● | |
| Fan Model | ● | ● | | | ● | | |
| Acoustics (Source Export) | ● | ● | | | ● | | |
| Acoustics (Noise Prediction) | ● | ▲ | | | | | |
| | | | | | | | |
| Heat Transfer | | | | | | | |
| Natural Convection | ● | ● | | | ● | ● | ● |
| Conduction & Conjugate Heat Transfer | ● | ● | | | ● | ● | ● |
| Shell Conduction (including multi-layer model) | ● | | | | | | |

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| Internal Radiation - Participating Media | ● | ● | ● | | ● | | ● |
| Internal Radiation - Transparent Media | ● | ● | | | | | ● |
| External Radiation | ● | ● | | | | ● | ● |
| Solar Radiation & Load | ● | ● | | | | | |
| Simplified Heat Exchanger Model | ● | | | | | | |
| Non-equilibrium Thermal Model | ● | | | | | | |
| Prorous Media | ● | | | | | | |
| Particles Flows (Multiphase) | | | | | | | |
| Coupled Discrete Phase Modeling including Thin Wall Films | ● | ● | | ● | ● | ▲ | ● |
| Macroscopic Particle Model | ● | | | | | ▲ | |
| Inert Particle Tracking (With Mass) | ● | ● | | | | ▲ | |
| Liquid Droplet (Incl. Evaporation) | ● | ● | | ● | ● | | ● |
| Combusting Particles | ● | ● | | ● | | | ● |
| Multicomponent Droplets | ● | ● | | ● | ● | | ● |
| Discrete Element Model (DEM) | ● | | | | | | |
| Break-Up And Coalescence | ● | ● | | ● | ● | | ● |
| Erosion | ● | ● | | | | | |
| Free Surface Flows (Multiphase) | | | | | | | |
| Implicit VOF | ● | ● | ● | | | | |
| Explicit VOF | ● | | ● | | | | |
| Coupled Level Set/VOF | ● | ● | | | ● | | |
| Open Channel Flow And Wave | ● | ● | | | | | |
| Surface Tension | ● | ● | | ● | ● | | ● |
| Phase Change | ● | ● | | ● | ● | | ● |
| Cavitation | ● | ● | | ● | ● | | ● |
| Cavitation where multiple fluids and non-condensing gases are present | ● | | | | | | |
| Dispersed Multiphase Flows (Multiphase) | | | | | | | |
| Mixture Fraction | ● | ● | | | | | |
| Eulerian Model including Thin Wall Films | ● | ● | | ● | ● | | ● |
| Boiling Model | ● | ● | | ● | | | ● |
| Surface Tension | ● | ● | | ● | | | ● |
| Phase Change | ● | ● | | ● | ● | | ● |
| Drag And Lift | ● | ● | | ● | ● | | ● |
| Wall Lubrication | ● | ● | | ● | | | ● |
| Heat And Mass Transfer | ● | ● | | ● | ● | | ● |
| Population Balance | ● | ● | | ● | | | ● |
| Reactions Between Phases | ● | ● | | ● | | | ● |
| Granular Model for Dense Bed of Solids | ● | ● | | | | | |
| Dense Particulate Coupling (DDPM) | ● | ● | | | | | |

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| Reacting Flows | | | | | | | |
| Species Transport | ● | ● | ● | ● | | | ● |
| Non-Premixed Combustion | ● | ● | | ● | | | ● |
| Premixed Combustion | ● | ● | | ● | | | ● |
| Partially Premixed Combustion | ● | ● | | ● | | | ● |
| Composition PDF Transport | ● | ● | | | | | |
| Finite Rate Chemistry | ● | ● | ● | ● | | | ● |
| Pollutants And Soot Modeling | ● | ● | | ● | | | ● |
| Sparse chemistry solver with dynamic cell clustering and dynamic adaptive chemistry | ● | | | ● | | | ● |
| Ability to use Model Fuel Library mechanisms | ● | | | ● | | | ● |
| Flame-speed from Fuel-component Library | ● | | | ● | | | ● |
| DPIK Spark-ignition Model | | | | ● | | | ● |
| Flame-propagation using level-set method (G-equation) | | | | ● | | | ● |
| Internal Combustion Engine Specific Solution | ● | ● | | ● | | | ● |
| 0-D/1-D/2-D reactor models and reactor networks | | | | | | | ● |
| Plasma reactions | | | | | | | ● |
| Comprehensive surface-kinetics | ● | | | | | | ● |
| Chemical and phase equilibrium | ● | | | | | | ● |
| Flamelet table generation | ● | | | | | | ● |
| Flamespeed and ignition table generation | | | | | | | ● |
| Reaction sensitivity, uncertainty and path analysis | | | | | | | ● |
| Surrogate blend optimizer | | | | | | | ● |
| Mechanism Reduction | | | | | | | ● |
| Turbomachinery | | | | | | | |
| MRF/Frozen-Rotor | ● | ● | | | | | |
| Sliding-Mesh/Stage | ● | ● | | | | | |
| Transient Blade Row | | ● | | | | | |
| Pitch Change | | ● | | | | | |
| Time Transformation | | ● | | | | | |
| Fourier Transformation | | ● | | | | | |
| Harmonic Analysis | | ● | | | | | |

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| Blade Flutter Analysis | | ● | | | | | |
| Forced Response Analysis | | ● | | | | | |
| Flank milled blades | | ● | | | | | |
| In-Flight Icing | | | | | | | |
| Simulates Droplet Sizes | | | | | ● | | |
| Simulates Ice Growth and Performs Visibility Studies | | | | | ● | | |
| Models Heat Transfer Anti- and De-icing Heat Loads | | | | | ● | | |
| Rotating frame of reference for the analysis of turbomachines, rotors and propellers | | | | | ● | | |
| Model ice accretion at engine face (Fan and IGV) and within any number of successive compressor stages | | | | | ▲ | | |
| Aerodynamic degradation (CFD) meets the requirements of Appendix C, Appendix D (Ice Crystals) and Appendix O (SLD) | | | | | ● | | |
| Optimization | | | | | | | |
| Parameters | ● | ● | ● | | | ● | |
| Design Point Studies | ● | ● | ● | | | ● | |
| Correlation Analysis | ● | ● | ● | | | ● | |
| Design of Experiments | ● | ● | ● | | | ● | |
| Sensitivity Analysis | ● | ● | ● | | | ● | |
| Goal Driven Optimization | ● | ● | ● | | | ● | |
| Six Sigma Analysis | ● | ● | ● | | | ● | |
| Adjoint Solver for Shape Optimization | ● | | | | | | |
| Adjoint solver supports rotating reference frames & conjugate heat transfer | ● | | | | | | |
| Multi-objective-constrained optimization | ● | | | | | | |
| Mesh Morphing (RBF Morph) | □ | | | | | | |
| High Rheology Material | | | | | | | |
| Viscoelasticity | | | ● | | | | |
| Specialty Extrusion Models | | | ● | | | ▲ | |
| Specialty Blow Molding Models | | | ● | | | ▲ | |
| Specialty Fiber Spinning Models | ● | | | | | | |

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| | ANSYS CFD Enterprise | | | | | | ANSYS Chemkin Enterprise |
|--|----------------------|-----------|----------------|-------------|------------------|-----------|--------------------------|
| | ANSYS CFD Premium | | ANSYS POLYFLOW | ANSYS Forte | ANSYS FENSAP-ICE | ANSYS AIM | |
| | ANSYS FLUENT | ANSYS CFX | | | | | |
| HPC – Fluids | | | | | | | |
| Parallel Solving On Local PC Option | ● | ● | ● | ● | ● | ● | ● |
| Parallel Solving Over Network Option | ● | ● | ● | ● | ● | ● | ● |
| GPU Support | ● | | ● | | | | |
| Pre and Post Processing | | | | | | | |
| Photo realistic rendering | ● | ● | ● | ● | ● | | ● |
| SpaceClaim Direct Modeler | ● | ● | ● | ● | ● | ● | ● |
| Compare multiple runs, datasets physics, graphs in a single window | ● | ● | ● | ● | ● | | ● |
| MULTIPHYSICS | | | | | | | |
| Advanced, Automated Data Exchange | ● | ● | ● | | ● | ● | |
| Accurate Data Interpolation Between Dissimilar Meshes | ● | ● | | | ● | ● | |
| Drag-n-Drop Multiphysics | ● | ● | ● | | | | |
| Direct Coupling Between Physics | ● | ● | | | | ● | |
| Collaborative Workflows | ● | ● | | | | ● | |
| Fully Managed Co-Simulation | ● | ● | | | | | |
| Flexible Solver Coupling Options | ● | ● | | | ● | | |
| Fluid-Structure Interaction | | | | | | | |
| Force Induced Motion/Deformation | □ | □ | ● | | | ● | |
| Fluid Thermal Deformation | □ | □ | | | | ● | |
| Electro-Thermal Interaction | | | | | | | |
| Convection Cooled Electronics | ● | ● | | | | | |
| Conduction Cooled Electronics | ● | ● | | | | | |
| High Frequency Thermal Management | ● | ● | | | | | |
| Electromechanical Thermal Management | ● | ● | | | | | |
| Other Coupled Interactions | | | | | | | |
| Aero-Vibro Acoustics | ● | | | | | | |
| Acoustics-Structural | ● | ● | | | | | |
| Fluid Magnetohydrodynamics | ● | ● | | | | | |
| Miscellaneous and Usability | | | | | | | |
| Support ACT Extensions | ● | | | | | | |
| Ansyes Spaceclaim | | | | | | ● | |

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| | ANSYS Maxwell | ANSYS HFSS | ANSYS SIwave | ANSYS Q3D Extractor | ANSYS Icepak | ANSYS AIM |
|---|---------------|------------|--------------|---------------------|--------------|-----------|
| ELECTRONICS | | | | | | |
| Low Frequency Electromagnetics | | | | | | |
| Electrostatics | ● | | | | | ● |
| AC Conduction | ● | | | | | ● |
| DC Conduction | ● | | | | | ● |
| Magnetostatics | ● | | | | | ● |
| Adaptive Field Mesh | ● | ● | ● | ● | | ● |
| AC Harmonic Magnetic | ● | | | | | ● |
| Electric Transient | ● | | | | | |
| Magnetic Transient | | | | | | |
| Translational Motion | ● | | | | | |
| Fully Automatic Symmetrical Mesh Generation | ● | | | | | |
| Rotational Motion | ● | | | | | |
| Non-Cylindrical Motion | ● | | | | | |
| Advanced Embedded Circuit Coupling | ● | | | | | |
| Circuit Coupling with Adaptive Time Stepping | ● | | | | | |
| Direct and Iterative Matrix Solvers | ● | | | | | |
| Advanced Magnetic Modeling | | | | | | |
| Vector Hysteresis Modeling | ● | | | | | |
| Hysteresis Modeling for Anisotropic Material | ● | | | | | |
| Frequency Dependent Reduced Order Models | ● | | | | | |
| Equivalent Model Extraction (Linear-Motion, Rotational-Motion, No-Motion) | ● | | | | | |
| Functional Magnetization Direction | ● | | | | | |
| Magnetization/De-magnetization Modeling | ● | | | | | |
| Manufacturing Dependent Core Loss Models | ● | | | | | |
| Noise - Vibration Modeling | □ | | | | | |
| Temperature De-magnetization Modeling | ● | | | | | |
| Core Loss computation | ● | | | | | ● |
| Lamination Modeling | ● | | | | | |

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|--|---------------|------------|--------------|---------------------|--------------|
| Magnetostriction and Magnetoelastic Modeling | ● | | | | |
| Hardware in the Loop modeling | ● | | | | |
| Integrated Motor Synthesis and Design Kit | ● | | | | |
| Integrated Planar Magnetics Synthesis and Design Kit | ● | | | | |
| High Frequency Electromagnetics | | | | | |
| Multi-frequency broadband adaptive meshing | | ● | | | |
| Frequency, Integral Equation and Time Domain Analysis | | ● | | | |
| Eigenmode Analysis | | ● | | | |
| Hybrid Finite Element/Integral Equation Analysis | | ● | | | |
| Hybrid Finite Element/Shooting and Bouncing Ray Analysis | | ● | | | |
| Modal Wave Port Excitation | | ● | | | |
| Parametric Antenna Excitations for SBR+ | | ● | | | |
| Lumped, Voltage and Current Excitations | | ● | | | |
| Floquet Excitations | | ● | | | |
| Incident Wave Excitation | | ● | | | |
| Magnetic Ferrite Bias Excitation | | ● | | | |
| Terminal Solutions | | ● | | | |
| Perfect Electric and Magnetic Boundary | | ● | | | |
| Finite Conductivity Boundaries | | ● | | | |
| Lumped RLC Boundary | | ● | | | |
| Symmetry Boundary | | ● | | | |
| Periodic Boundary | | ● | | | |
| Frequency dependant materials | | ● | | | |
| Higher and Mixed order Elements | | ● | | | |
| Curvilinear Elements | | ● | | | |
| Fully automated adaptive mesh refinement | | ● | | | |
| S,Y,Z Matrix Results | | ● | | | |
| E, H, J, P Field Results | | ● | | | |
| Direct and Iterative Matrix Solvers | | ● | | | |

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| | ANSYS Maxwell | ANSYS HFSS | ANSYS SIwave | ANSYS Q3D Extractor | ANSYS Icepak |
|---|---------------|------------|--------------|---------------------|--------------|
| Antenna Parameter Calculation | | ● | | | |
| Infinite and Finite Antenna Array Calculations | | ● | | | |
| Radar Cross Section calculation | | ● | | | |
| FSS, EBG and Metamaterial Calculation | | ● | | | |
| Specific Absorption Rate Calculation | | ● | | | |
| EMI/EMC Calculation | | ● | | | |
| System Level EMI and RFI analysis | | ● | | | |
| Linear Circuit Analysis with EM Dynamic link | | ● | | | |
| Integrated Antenna Synthesis and Design Kit | | ● | | | |
| Shooting and Bouncing Ray+ (SBR+) Solver | | ● | | | |
| Integrated Parametric 3D Component Libraries | | ● | | | |
| RF Link Budget Analysis | | ● | | | |
| Wireless Propagation Models | | ● | | | |
| Visual Ray Tracing | | ● | | | |
| Power and Signal Integrity | | | | | |
| Board Simulation Capabilities | | | | | |
| Electronics Desktop 3D Layout GUI | | ● | ● | | ● |
| ECAD Translation (Altium, Cadence, Mentor, Pulsonix, & Zuken) | | ● | ● | | |
| MCAD (.sat) Generation from ECAD | | ● | ● | | |
| Lead Frame Editor | | ● | ● | | |
| DC Voltage, Current and Power Analysis for PKG/PCB | | | ● | | |
| DC Joule Heating with ANSYS Icepak | | | ● | ● | ● |
| Passive Excitation Plane Resonance Analysis | | | ● | | |
| Driven Excitation Plane Resonance Analysis | | | ● | | |
| Automated Decoupling Analysis | | | ● | | |
| Capacitor Loop Inductance Analysis | | | ● | | |
| AC SYZ Analysis - PI, SI, & EMI | | ● | ● | | |
| Dynamically Linked Electromagnetic Field Solvers | | ● | ● | | |

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| | ANSYS Maxwell | ANSYS HFSS | ANSYS SIwave | ANSYS Q3D Extractor | ANSYS Icepak |
|---|---------------|------------|--------------|---------------------|--------------|
| Chip, Package, PCB Analysis (CPM) | | ● | ● | | |
| Near-Field EMI Analysis | | | ● | | |
| Far-Field EMI Analysis | | | ● | | |
| Characteristic Impedance (Zo) | | | ● | | |
| PKG/PCB Scan | | | ● | | |
| Full PCB/PKG Cross-talk Scanning | | | ● | | |
| TDR Analysis | | ● | ● | | |
| Transient IBIS Circuit Analysis | | | ● | | |
| SerDes IBIS-AMI Circuit Analysis | | | ● | | |
| Macro-Modeling (Network Data Explorer) | | ● | ● | ● | |
| Steady State AC (LNA) Analysis | | ● | ● | | |
| Virtual Compliance - DDRx, GDDRx, & LPDDRx | | | ● | | |
| Synopsys HSPICE Integration | | | ● | | |
| Cadence PSPICE Support | | | ● | | |
| Electromagnetically Circuit Driven Field Solvers | | ● | ● | | |
| RLCG Parasitic Extraction | | | | | |
| DCRL, ACRL & CG Solver | | | ● | ● | |
| IC Packaging RLCG IBIS Extraction for Signals & Power | | | ● | ● | |
| Touchpanel RLCG Unit Cell Extraction | | | ● | ● | |
| Adaptive Meshing for Accurate Extraction | | | ● | ● | |
| Bus Bar RLCG Extraction | | | | ● | |
| Power Inverter & Converter Component Extraction | | | | ● | |
| Specialized Thin Plane Solver for Touchpanel Extraction | | | | ● | |
| 3D Component Library | | ● | | ● | |
| Reduced RLCG Matrix Operations | | | | ● | |
| SPICE equivalent Modeling Export | | | | ● | |
| DCRL & ACRL Joule Heating Analysis with Icepak | | | | ● | |
| Macro-modeling (Network Data Explorer) | | | | ● | |
| 2D Transmission Line Modeling Toolkit | | | | ● | |
| 2D Cable Modeling Toolkit | | | | ● | |

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| | ANSYS Maxwell | ANSYS HFSS | ANSYS SIwave | ANSYS Q3D Extractor | ANSYS Icepak |
|--|---------------|------------|--------------|---------------------|--------------|
| Electronics Cooling | | | | | |
| Multi-mode Heat Transfer | | | | | ● |
| Steady-state and Transient | | | | | ● |
| CFD Analysis | | | | | ● |
| Turbulent Heat Transfer | | | | | ● |
| Multiple-fluid Analysis | | | | | ● |
| Species Transport | | | | | ● |
| Solar Loading | | | | | ● |
| Reduced Order Flow and Thermal | | | | | ● |
| Network Modeling | | | | | ● |
| Joule Heating Analysis | □ | □ | □ | □ | ● |
| Thermo-electric Cooler Modeling | | | | | ● |
| Thermostat Modeling | | | | | ● |
| Package Characterization | | | | | ● |
| Data Center Modeling | | | | | ● |
| HPC for Electronics | | | | | |
| GPU Support | □ | □ | | | |
| HPC Accelerated Frequency Sweeps | | □ | ● | | |
| HPC Distributed Hybrid Solving | | ● | | | |
| HPC Enabled Domain Decomposition Method | | ● | | | |
| HPC Time Decomposition Method | ● | | | | |
| HPC Enabled Multi-port Excitation Acceleration | | ● | | | |
| HPC Acceleration for DCRL, ACRL and CG | | | | ● | |
| HPC Enabled Parallel Processing | ● | ● | | ● | ● |
| SYSTEMS MODELING - ELECTRONIC PRODUCTS | | | | | |
| System Modeling for Power Electronics | | | | | |
| Circuit Simulation | ● | ● | ● | ● | ● |
| Block Diagram Simulation | ● | ● | ● | ● | ● |
| State Machine Simulation | ● | ● | ● | ● | ● |
| VHDL-AMS Simulation | ● | ● | ● | ● | ● |
| Integrated Graphical Modeling Environment | ● | ● | ● | ● | ● |
| Power Electronics Component Libraries | ● | ● | ● | ● | ● |
| Reduced Order Modeling | ● | ● | ● | ● | ● |

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| | ANSYS Maxwell | ANSYS HFSS | ANSYS SIwave | ANSYS Q3D Extractor | ANSYS Icepak |
|--|---------------|------------|--------------|---------------------|--------------|
| Power Electronic Device and Module Characterization | ● | ● | ● | ● | ● |
| Co-Simulation with MathWorks Simulink | ● | ● | ● | ● | ● |
| System Modeling for RF/Microwave | | | | | |
| Radio Frequency Interference (RFI) System Solver | | □ | | | |
| Electromagnetic Interference System Solver | | □ | | | |
| RF Link Budget Analysis | | □ | | | |
| RF co-site and antenna coexistence analysis | | □ | | | |
| Automated diagnostics for rapid root-cause analysis | | □ | | | |
| RF component library | | □ | | | |
| Wireless Propagation Models | | □ | | | |
| Multi-fidelity parametric radio models | | □ | | | |
| Antenna-to-Antenna coupling models | | □ | | | |
| System Modeling for SI/PI | | | | | |
| SerDes channel modeling - IBIS-AMI, QuickEye and VerifEye | | □ | ● | | |
| Multi-drop & parallel bus modeling - IBIS, HSPICE, Spectre, PSPICE, and Nexxim Transient | | □ | ● | | |
| Network Data Exploration | | ● | ● | ● | |
| TDR analysis | | □ | ● | | |
| Steady State AC (LNA) Analysis | | □ | ● | | |
| Virtual Compliance - DDRx, GDDRx, & LPDDRx | | □ | ● | | |

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| | ANSYS Maxwell | ANSYS HFSS | ANSYS SIwave | ANSYS Q3D Extractor | ANSYS Icepak |
|---|---------------|------------|--------------|---------------------|--------------|
| MULTIPHYSICS | | | | | |
| Platform Technologies | | | | | |
| Advanced, Automated Data Exchange | ● | ● | | ● | ● |
| Accurate Data Interpolation Between Dissimilar Meshes | ● | ● | | ● | ● |
| Drag-n-Drop Multiphysics | ● | ● | | ● | ● |
| Direct Coupling Between Physics | ● | ● | | ● | ● |
| Collaborative Workflows | ● | ● | | ● | ● |
| Fully Managed Co-Simulation | ● | ● | | ● | ● |
| Flexible Solver Coupling Options | ● | ● | | ● | ● |
| Electro-Thermal Interaction | | | | | |
| Convection Cooled Electronics | | ● | | | ● |
| Conduction Cooled Electronics | | ● | | | ● |
| High Frequency Thermal Management | | ● | | ● | ● |
| Electromechanical Thermal Management | ● | | | ● | ● |
| Miscellaneous | | | | | |
| Support ACT Extensions | ▲ | ▲ | ▲ | ▲ | ▲ |

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| | ANSYS Twin Builder | ANSYS SCADE Architect | ANSYS SCADE Suite | ANSYS SCADE Display | Medini Analyze |
|--|--------------------|-----------------------|-------------------|---------------------|----------------|
| SYSTEMS & EMBEDDED SOFTWARE | | | | | |
| System Simulation, Validation and Digital Twins | | | | | |
| Integrated Graphical Modeling Environment | ● | | | | |
| Standard Modeling Languages and Exchange Formats | ● | | | | |
| Multi-domain Systems Modeler | ● | | | | |
| Extensive OD Application-Specific Libraries | ● | | | | |
| 3rd Party (1D) Tool Integrations | ● | | | | |
| 3D ROM | ● | | | | |
| Embedded Software Integration | ● | | | | |
| Multi-domain System Simulation | ● | | | | |
| Rapid HMI Prototyping | ● | | | | |
| System Optimization | ● | | | | |
| XIL Integration | ● | | | | |
| IIoT Connectivity | ● | | | | |
| Digital Twin Runtime Deployment | ● | | | | |
| Functional Safety Analysis | | | | | |
| Safety Concept Modelling | | | | | ● |
| Model Based Safety Analysis | | | | | ● |
| Reliability Prediction and Analysis | | | | | ● |
| Traceability and Validation Teamwork | | | | | ● |
| Integration into Engineering Environment | | | | | ● |
| Customization and Process Adaption | | | | | ● |
| ANSYS Product Integration | | | | | ● |
| Reporting and Documentation | | | | | ● |
| Model-based Systems Engineering | | | | | |
| Model-Based System Design | | ● | | | |
| Functional Safety Analysis | | ● | | | |
| Functional Decomposition | | ● | | | |
| Architecture Decomposition | | ● | | | |
| Allocation Of Functions To Components | | ● | | | |
| Model Checks | | ● | | | |
| System Model Diff/Merge | | ● | | | |
| System / Software Bi-Directional Sync | | ● | | | |
| Model Sharing And IP Protection | | ● | | | |
| Model-Based Interface Control | | ● | | | |
| Document Production | | ● | | | |
| Configurable For Industry Standards (IMA, AUTOSAR, Etc.) | | ● | | | |

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| | ANSYS Twin Builder | ANSYS SCADE Architect | ANSYS SCADE Suite | ANSYS SCADE Display | Medini Analyze |
|---|--------------------|-----------------------|-------------------|---------------------|----------------|
| Product configuration for automotive developers | | ● | | | |
| Embedded Control Software Development | | | | | |
| Data Flow And State Machine Design And Simulation Capabilities | | | ● | | |
| Extensive Set Of Libraries Delivered As Design Examples | | | ● | | |
| Simulation Capabilities | | | ● | | |
| Record And Playback Scenarios | | | ● | | |
| Integration In To Configuration Management Environment | | | ● | | |
| Plant Model Co-Simulation Including FMI | | | ● | | |
| Coverage Analysis For Requirements-Based Tests | | | ● | | |
| Formal Verification | | | ● | | |
| Timing And Stack Optimization | | | ● | | |
| Worst Case Execution Time Estimates On Target | | | ● | | |
| Verification Of Stack Space Requirements | | | ● | | |
| Certified Code Generation For DO-178C, EN 50128, ISO 26262, IEC 61508 | | | ● | | |
| Certification Kits For DO-178C, EN50128, ISO 26262, IEC 61508 | | | ● | | |
| Man-Machine Interface Software | | | | | |
| Model-Based Prototyping And Specification Of MMIs | | | | ● | |
| Support Of OpenGL, OpenGL SC and OpenGL ES | | | | ● | |
| Integration In To Configuration Management Environment | | | | ● | |
| Font Management | | | | ● | |
| Optimization Of Graphical Specifications | | | | ● | |
| Plant Model Co-Simulation Including FMI | | | | ● | |
| Automatic Generation Of iOS and Android Projects | | | | ● | |
| Certified Code Generation For DO-178C, EN 50128, ISO 26262, IEC 61508 | | | | ● | |
| Certification Kits For DO-178C, EN50128, ISO 26262, IEC 61508 | | | | ● | |
| Testing capabilities | | | | ● | |

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| | ANSYS Design Modeler | ANSYS SpaceClaim Direct Modeler |
|--|----------------------|---------------------------------|
| GEOMETRY | | |
| Direct Modeling Technology | | ● |
| Feature Based Modeling Technology | ● | |
| Open data from all major CAD systems | ● | ● |
| Export data to neutral file formats | ● | ● |
| Modify imported geometry | ● | ● |
| Defeaturing and simplification tools | ● | ● |
| Model Repair | ● | ● |
| Add Parameters for design exploration | ● | ● |
| Extract mid-surfaces/shells and beams | ● | ● |
| Extract volumes & create inner fluid domains | ● | ● |
| Extract outer air enclosures | ● | ● |
| Shared Topology for conformal meshing | ● | ● |
| Booleans and slicing | ● | ● |
| Create weld bodies | ● | ● |
| Boundary condition mapping | ● | ● |
| Scripting | ● | ● |
| Sketching and editing tools | ● | ● |
| 3D comparison tools | | ● |
| Repair and edit faceted data | | ● |
| Icepak integration | ● | ● |
| Reverse engineering faceted data | | ● |

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| | ANSYS Discovery Essentials | ANSYS Discovery Standard | ANSYS Discovery Ultimate |
|--|----------------------------------|--------------------------------|--------------------------------|
| DESIGN TOOLS | | | |
| Structural | | | |
| Static Structural Analysis | | ● | ● |
| Modal Analysis | | ● | ● |
| Pre-Stressed Modal Analysis | | | ● |
| Shells, Springs, Point Masses | | | ● |
| Spatially Varying Loads | | | ● |
| Nonlinear Contact & Joints | | | ● |
| Pre-tension Bolts & Multi-step Analysis | | | ● |
| Basic Plasticity | | | ● |
| Large Deformation | | | ● |
| Fatigue Analysis | | | ● |
| Topology Optimization | | | ● |
| Fluid | | | |
| Steady-State Flow | | ● | ● |
| Transient Flow | | ● | ● |
| Time-dependent Fluid Conditions | | | ● |
| Incompressible Flow | | | ● |
| Compressible Flow ¹ | | ▲ | ● |
| Non-Newtonian Fluids | | | ● |
| Periodic Domains | | | ● |
| Porous Media | | | ● |
| Particle Flow | | | ● |
| Thermal | | | |
| Steady State Thermal | | ● | ● |
| Transient Thermal | | ● | ● |
| Time Dependent Thermal Conditions | | | ● |
| Conduction | | ● | ● |
| Convection | | ● | ● |
| Radiation to Space | | | ● |
| Electromagnetics | | | |
| DC Conduction | | | ● |
| AC Conduction | | | ● |
| Electrostatics | | | ● |
| Magnetostatics | | | ● |
| AC Harmonic Magnetics | | | ● |

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| | ANSYS Discovery Essentials | ANSYS Discovery Standard | ANSYS Discovery Ultimate |
|--|----------------------------------|--------------------------------|--------------------------------|
| Multiphysics | | | |
| Thermal-stress | | | ● |
| Fluid-structure interaction | | | ● |
| Fluid-solid thermal (conjugate heat transfer) | | | ● |
| Thermal-electric | | | ● |
| Thermal-electric-stress | | | ● |
| Thermal-electromagnetic | | | ● |
| Thermal-electromagnetic-stress | | | ● |
| Design & Concept Modeling | | | |
| Concept Modeling or Detail Design | ● | ● | ● |
| Part/Assembly Creation or Import | ● | ● | ● |
| Large Assembly Importing | ● | ● | ● |
| 2-D Drawings, BOM, Exploded Views | ● | ● | ● |
| Geometric Parameterization | ● | ● | ● |
| Sheet metal design | ● | ● | ● |
| Manufacturing | | | |
| Repair & Defeature Tools | ● | ● | ● |
| Sheet metal editing and unfolding | ● | ● | ● |
| 3-D Printing² | | | |
| Import, repair, edit faceted data | ● | ● | ● |
| Shelling and infills | ● | ● | ● |
| Thickness detection | ● | ● | ● |
| Reverse Engineering | | | |
| Autosurface of scanned data | ● | ● | ● |
| Build solid/surfaces on scanned data | ● | ● | ● |
| Interfaces and Addons | | | |
| Catia/JT translator | ● | ● | ● |
| Algorx Momentum ³ | ● | ● | ● |
| Keyshot rendering ³ | ● | ● | ● |

- Notes:** (1) Discovery Live supports mildly compressible fluid flow up to ~Mach 0.3
(2) Included with Discovery Standard and Ultimate
(3) Add-on Module

- = Fully Supported
- ▲ = Limited Capability
- = Requires more than 1 product

| | Additive Print | Additive Suite* | Mechanical Enterprise |
|---|----------------|-----------------|-----------------------|
| ADDITIVE PRINT | | | |
| Topology and Lattice Optimization | | | |
| Structural Optimization | | | ● |
| Modal Optimization | | | ● |
| Thermal Loads | | | ● |
| Inertial Loads | | | ● |
| Optimized Design Validation | | | ● |
| Manufacturing Constraints | | | ● |
| Stress Constraints | | | ● |
| Symmetry | | | ● |
| Lattice Optimization | | ● | □ |
| Overhang/Additive Constraints | | ● | □ |
| Geometry and STL file handling | | | |
| SpaceClaim Direct Modeler | ● | ● | ● |
| Workbench Additive | | | |
| Nonlinear And Temperature Dependent Material Properties | | ● | |
| Thermo-Mechanical Coupled Strain Solution | | ● | |
| Native Mechanical Environment | | ● | |
| Stress-based Automatically Generated Supports | | ● | |
| Part Distortion & Residual Stress (as-built) | | ● | |
| Part Distortion & Residual Stress After Support Removal | | ● | |
| Distortion Compensation | | ● | |
| Blade Crash Detection | | ● | |
| Identification Of High Strain (Crack) Locations | | ● | |
| Layer By Layer Stress & Distortion Visualizations | | ● | |
| Additive Print | | | |
| Nonlinear and Temperature Dependent Material Properties | ● | ● | |
| Uniform Assumed Isotropic Strain | ● | ● | |
| Scan Pattern Based Anisotropic Strain | ● | ● | |
| Thermal Ratcheting Based Anisotropic Strain | ● | ● | |

| | Additive Print | Additive Suite* | Mechanical Enterprise |
|--|----------------|-----------------|-----------------------|
| Desktop & Cloud Stand-Alone Environments | ● | ● | |
| Stress-based Automatically Generated Supports | ● | ● | |
| Part Distortion & Residual Stress (as-built) | ● | ● | |
| Part Distortion & Residual Stress After Support Removal | ● | ● | |
| Distortion Compensation | ● | ● | |
| Blade Crash Detection | ● | ● | |
| Identification Of High Strain (Crack) Locations | ● | ● | |
| Layer By Layer Stress, Distortion & Blade Crash Visualizations | ● | ● | |
| Build File Readers For Multiple AM Machines | ● | ● | |
| Additive Science (beta) | | | |
| Nonlinear and Temperature Dependent Material Properties | | ● | |
| Meltpool Dimensions | | ● | |
| Detailed Thermal History | | ● | |
| % Porosity | | ● | |
| Sensor Measurement Predictions | | ● | |

* Additive Suite requires a Mechanical Enterprise license

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ANSYS Speos

OPTICS

Photometry

| | |
|-------------------|---|
| Intensity | ● |
| Illuminance | ● |
| Luminance | ● |
| 3D Illuminance | ● |
| 3D Energy Density | ● |

Human Vision

| | |
|--------------------|---|
| Dynamic Adaptation | ● |
| Glare Simulation | ● |

Wavelength Range

| | |
|---------------------|--|
| UV-FIR (50nm–100µm) | |
|---------------------|--|

Optical Design

| | |
|--------------------------|---|
| Parabolic Surface | ● |
| TIR Lens | ● |
| Projection Lens | ● |
| Optical Lens | ● |
| Optical Surface | ● |
| Light Guide | ● |
| Sharp Cut-Off Reflector | ● |
| Poly-Ellipsoidal Surface | ● |
| Micro Optical Stripes | ● |

Optical Sensors

| | |
|---------------|---|
| Field Of View | ● |
| Camera Sensor | ● |
| LiDAR Sensor | ● |
| Sensor Fusion | ● |

Head-up Display

| | |
|----------------------|---|
| HUD Optical Analysis | ● |
| HUD Optical Design | ● |
| HUD Visualisation | ● |

Manufacturing Variation

| | |
|----------------------|---|
| Target Specification | ● |
| Tolerance Study | ● |

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ANSYS Speos

| Solver | |
|-----------------------------------|---|
| Multi-Threading | ● |
| Highly Scalable HPC | ● |
| Add-on Features | |
| Optimizer | ● |
| Design of Experiment | ● |
| Regulation Check | ● |
| Colorimetry | ● |
| Light Expert | ● |
| 3D Textures | ● |
| 3D Energy Density | ● |
| Polarization | ● |
| Fluorescence | ● |
| 360° view | ● |
| Sky | ● |
| Visibility & Legibility | ● |
| Stray Light Analysis | ● |
| High Dynamic Range Screen support | ● |
| Virtual BSDF Bench | ● |
| Thermic Source | ● |
| MODTRAN Interface | ▲ |
| Night Vision Goggle | ● |



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