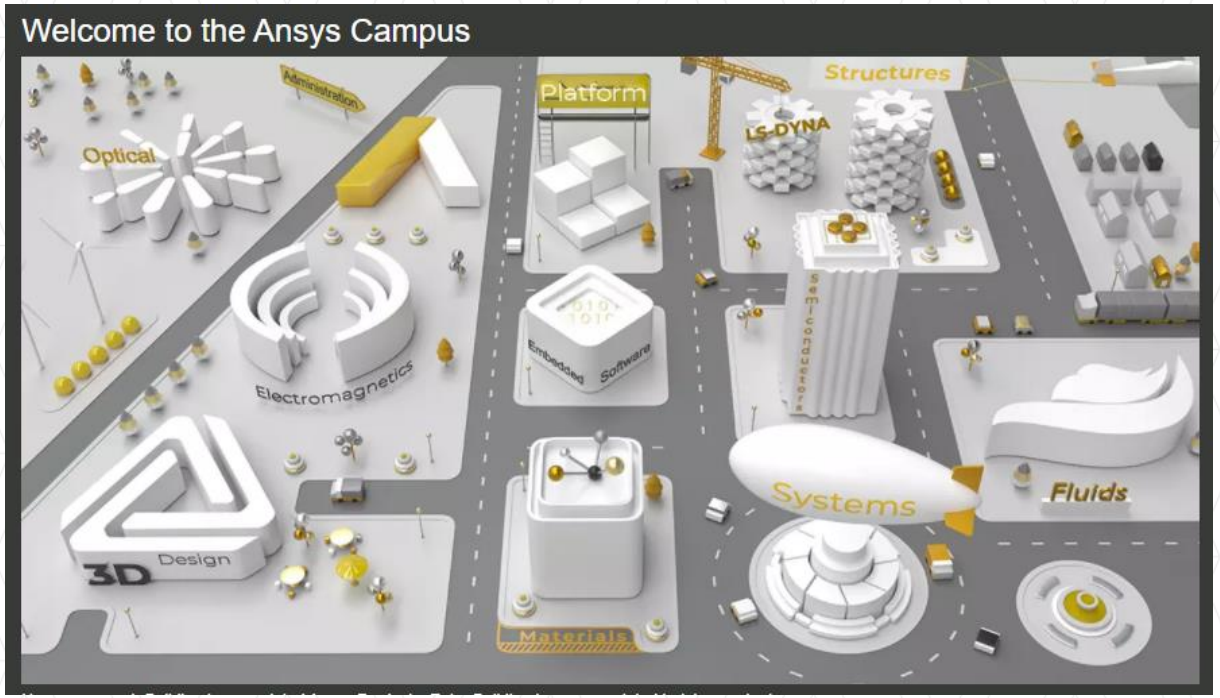
Ansys Learning Hub

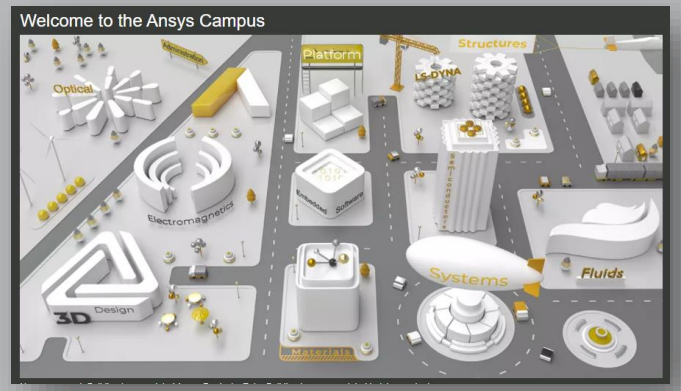
What You Need When You Need it



What is Ansys Learning Hub (ALH)

***ALH** is a learning management system and centralized knowledge portal that offers **rich learning resources** and **continuous learning** experiences to Ansys customers **across the portfolio**.*

*The training focus on making the user **become productive** with the ANSYS Tools **in the most efficient way** and range from typical software training, to fundamental theory to application learning.*



Learning on ALH and the Ansys Campus is easy, efficient and flexible, cost effective and fun!

Self-paced Learning
900+ recorded video modules
240+ hours

Collaborative Learning Rooms
45+ Topic Specific Learning Rooms with “learn from the expert” material and live feed for Q&A.

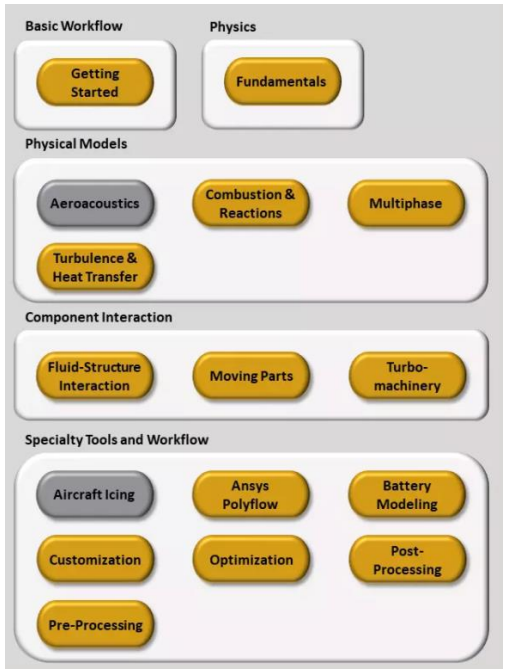
Live Classroom Classes
200+ In-Center Classes per year

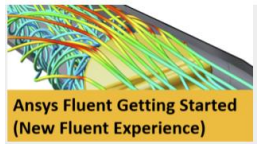
Live Virtual Classes
300+ Virtual Classes per year

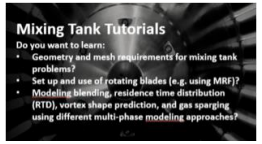
Course Material
240+ courses
1000+ workshops

Ansys Campus Buildings – Full Portfolio Coverage

Welcome to the Fluids Building



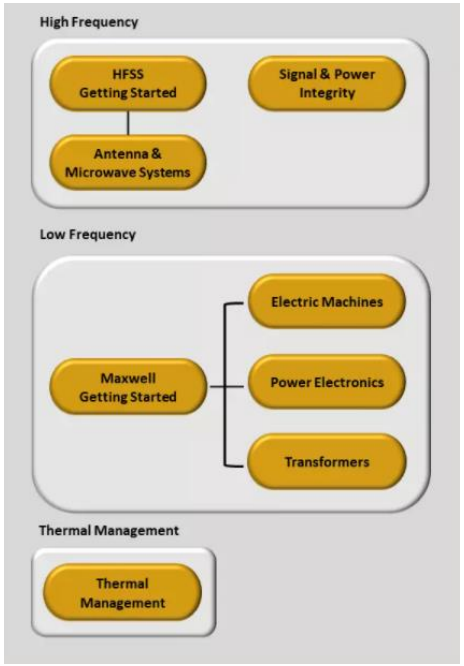


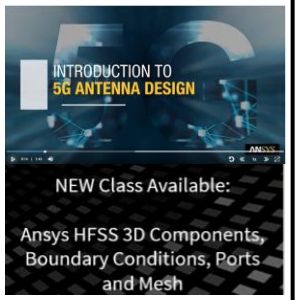


The Fluids Building hosts:

Ansys CFX
Ansys Fluent
Ansys Chemkin-Pro
Ansys Energico
Ansys FENSAP-ICE
Ansys Forte
Ansys Polyflow
Ansys Turbo Tools
Ansys DesignXplorer
Ansys EnSight
Ansys ICEM CFD
Ansys Meshing
Ansys OptiSLang
Ansys DesignModler
Ansys Reaction Workbench
Ansys SpaceClaim DirectModeler

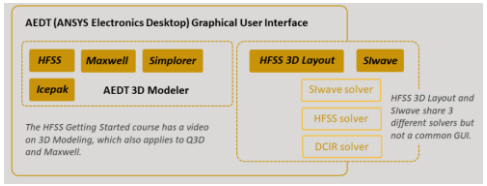
Welcome to the Electromagnetics Building



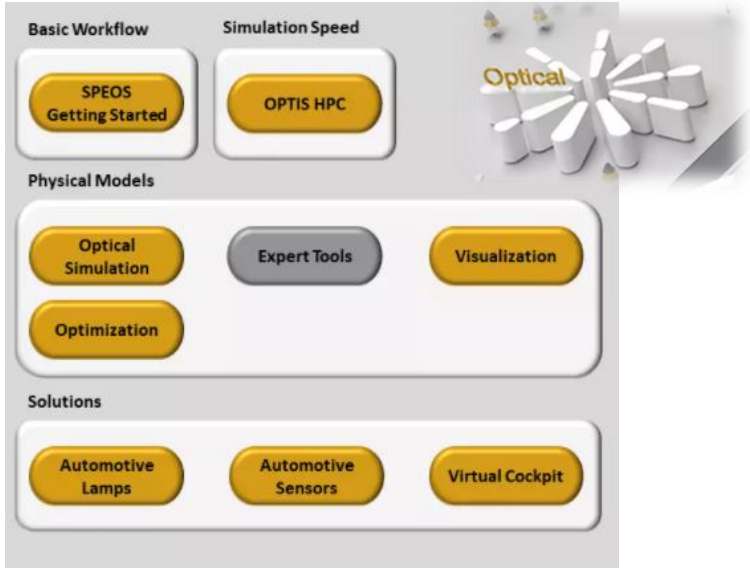


The Electromagnetics Building hosts:

Ansys HFSS
Ansys Icepak
Ansys Maxwell
Ansys Pexpert
Ansys Simplorer
Ansys Siwave



Welcome to the Optical Building

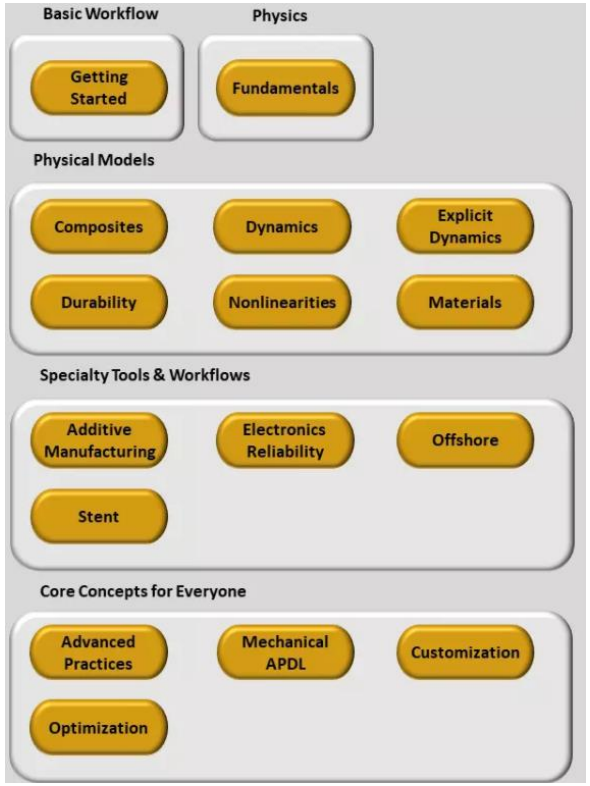


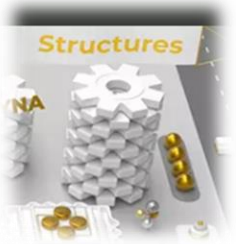
The Optics Building hosts:

Ansys Speos
Ansys Speos for NX
Ansys Speos for Creo Parametric
Ansys Optis HPC
Ansys SpaceClaim Direct Modeler

Ansys Campus Buildings – Full Portfolio Coverage

Welcome to the Structures Building





Upcoming Events in Additive Manufacturing

Meet the Experts Master Classes

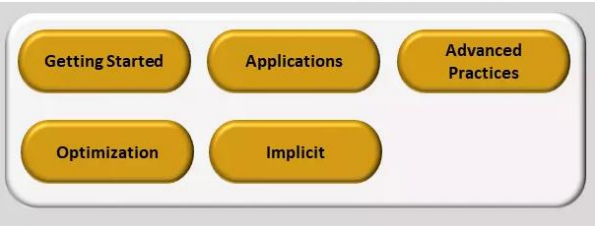
Make EVEN Better Simulations

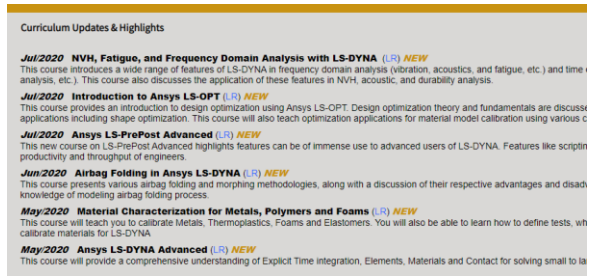
A Second Series of Events

The Structures Building hosts:

Ansys Mechanical
Ansys Additive Print
Ansys Aqwa
Ansys Autodyn
Ansys ACT
Ansys Mechanical APDL
Ansys Motion
Ansys Composite PrepPost
Ansys nCode DesignLife
Ansys Sherlock
Ansys Meshing
Ansys OptiSLang
Ansys SpaceClaim Direct Modeler
Ansys SpaceClaim Meshing
Ansys DesignModeler

LS-DYNA Building

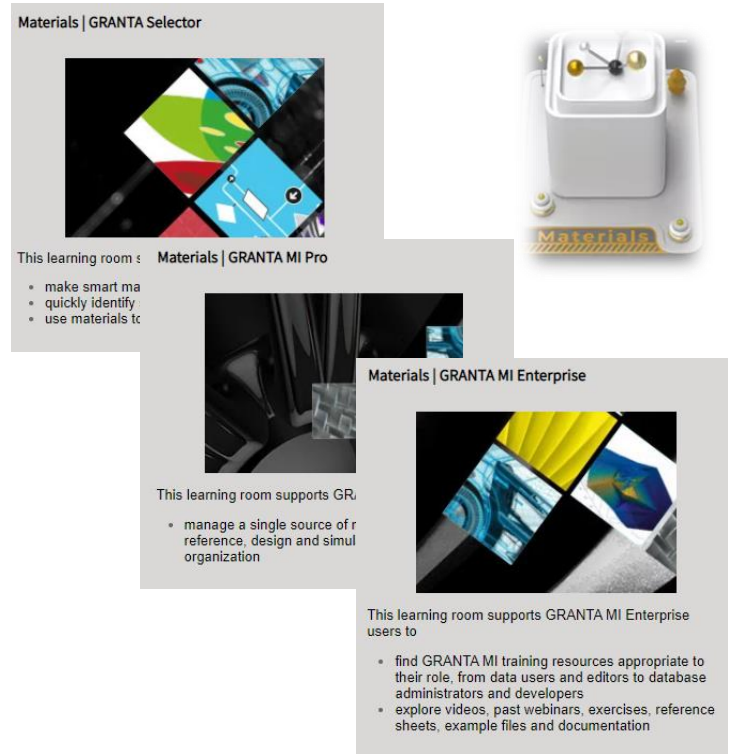




The LS-DYNA Building hosts:

Ansys LS-DYNA

Welcome to the Materials Building

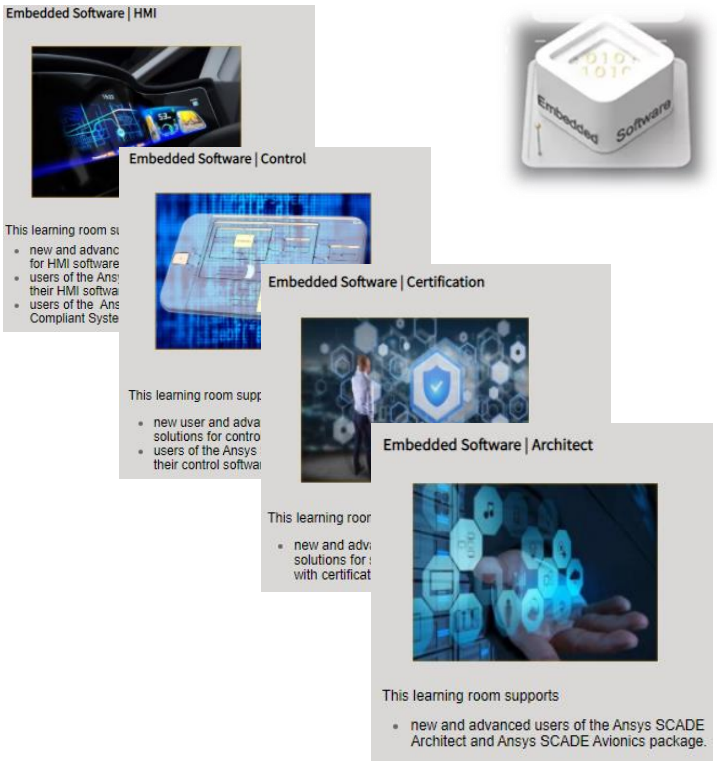


The Materials Building hosts:

GRANTA Selector
GRANTA MI Pro
GRANTA MI Enterprise

Ansys Campus Buildings – Full Portfolio Coverage

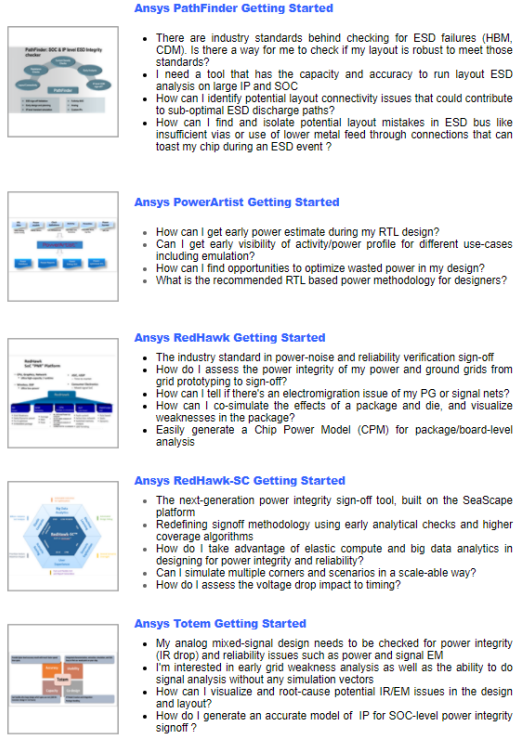
Welcome to the Embedded Software Building



The Embedded Software Building hosts:

- Ansys Scade Architect
- Ansys Scade Display
- Ansys Scade Suite
- Ansys Scade Test
- Ansys Scade Solutions for ARINC
- Ansys Scade Solutions for ISO

Semiconductors | Getting Started



Ansys PathFinder Getting Started

- There are industry standards behind checking for ESD failures (HBM, CDM). Is there a way for me to check if my layout is robust to meet those standards?
- I need a tool that has the capacity and accuracy to run layout ESD analysis on large IP and SOC
- How can I identify potential layout connectivity issues that could contribute to sub-optimal ESD discharge paths?
- How can I find and isolate potential layout mistakes in ESD bus like insufficient vias or use of lower metal feed through connections that can toast my chip during an ESD event ?

Ansys PowerArtist Getting Started

- How can I get early power estimate during my RTL design?
- Can I get early visibility of activity/power profile for different use-cases including emulation?
- How can I find opportunities to optimize wasted power in my design?
- What is the recommended RTL based power methodology for designers?

Ansys RedHawk Getting Started

- The industry standard in power-noise and reliability verification sign-off
- How do I assess the power integrity of my power and ground grids from grid prototyping to sign-off?
- How can I tell if there's an electromigration issue of my PG or signal nets?
- How can I co-simulate the effects of a package and die, and visualize weaknesses in the package?
- Easily generate a Chip Power Model (CPM) for package/board-level analysis

Ansys RedHawk-SC Getting Started

- The next-generation power integrity sign-off tool, built on the SeaScape platform
- Redefining signoff methodology using early analytical checks and higher coverage algorithms
- How do I take advantage of elastic compute and big data analytics in designing for power integrity and reliability?
- Can I simulate multiple corners and scenarios in a scale-able way?
- How do I assess the voltage drop impact to timing?

Ansys Totem Getting Started

- My analog mixed-signal design needs to be checked for power integrity (IR drop) and reliability issues such as power and signal EM
- I'm interested in early grid weakness analysis as well as the ability to do signal analysis without any simulation vectors
- How can I visualize and root-cause potential IR/EM issues in the design and layout?
- How do I generate an accurate model of IP for SOC-level power integrity signoff ?

The Semiconductors Building hosts:

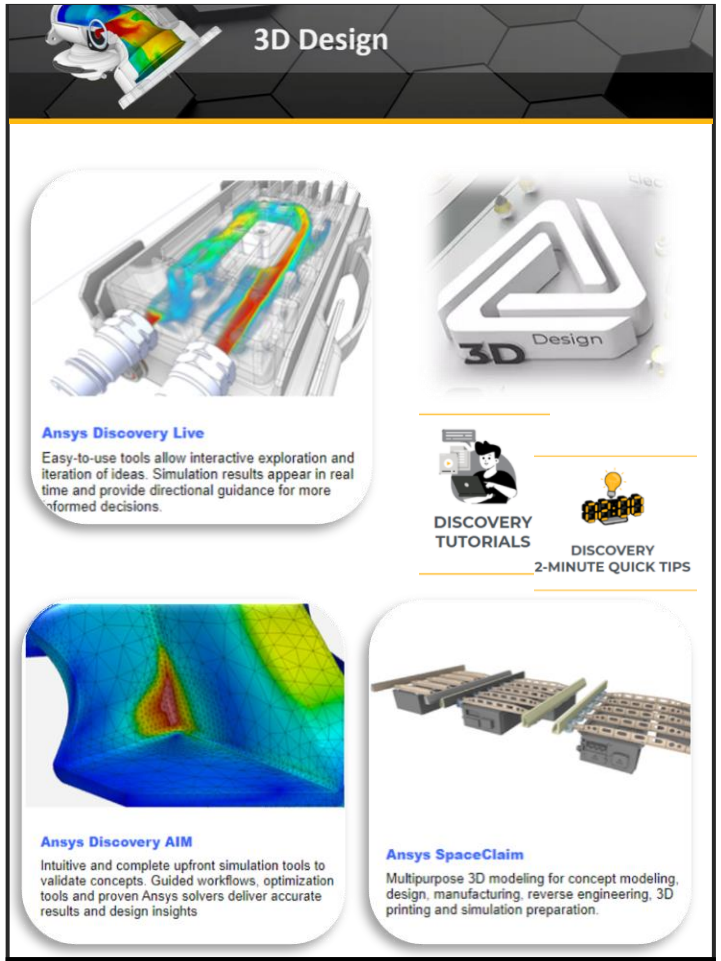
- Ansys PowerArtist
- Ansys Totem
- AnsysPathFinder
- Ansys RedHawk
- Ansys RedHawk-SC

Welcome to the Systems Building

The System Building hosts:

- Ansys Twin Builder
- Ansys VRXPERIENCE
- Ansys Medini

Ansys Campus Buildings – Full Portfolio Coverage



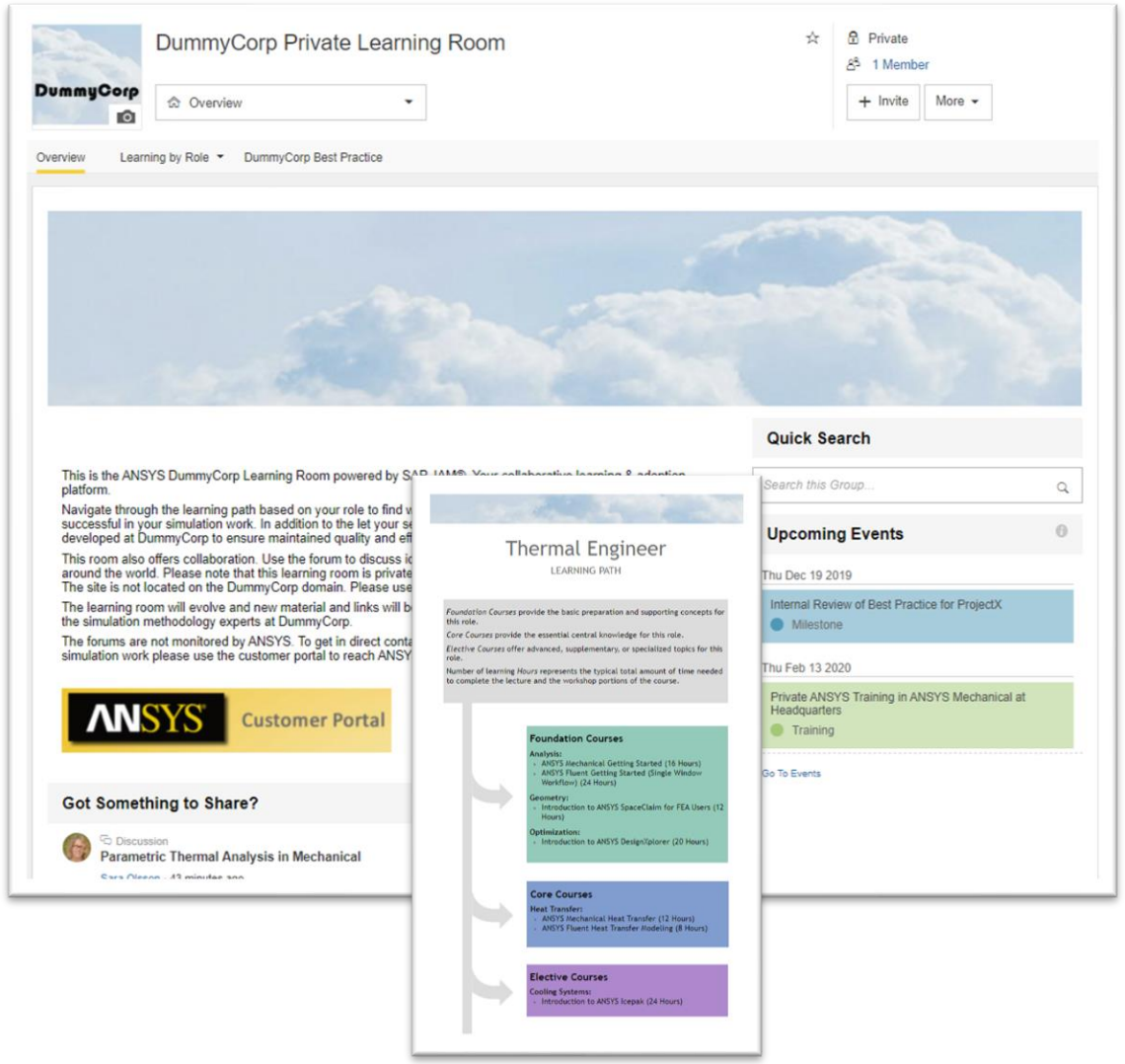
The 3D Design Building hosts:
Ansys Discovery Live
Ansys Discovery AIM **Ansys Discovery SpaceClaim**

The Platform Building hosts:
Ansys Cloud
Ansys Minerva **Ansys OptiSLang**

Ansys Learning Hub – Private Rooms and Customisation

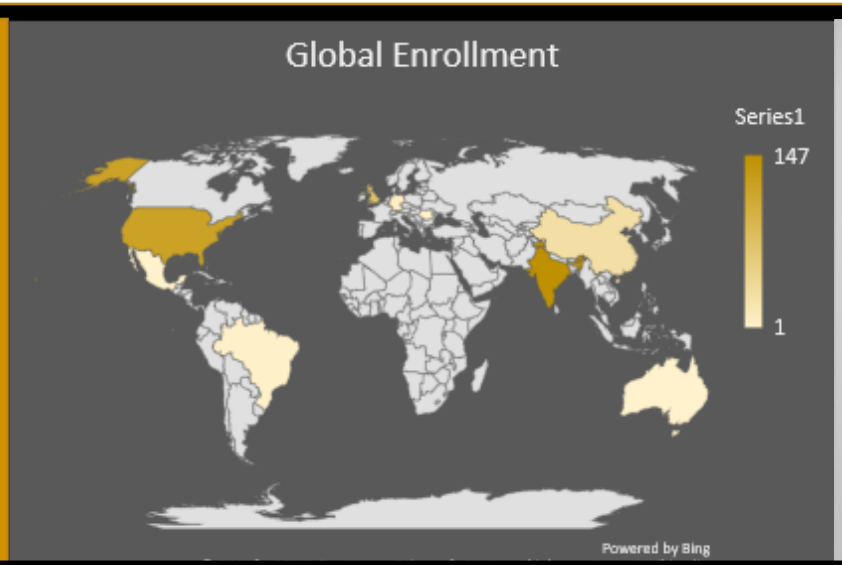
For companies with corporate subscriptions Ansys can in collaboration with the customer create a private space. The private learning room could include:

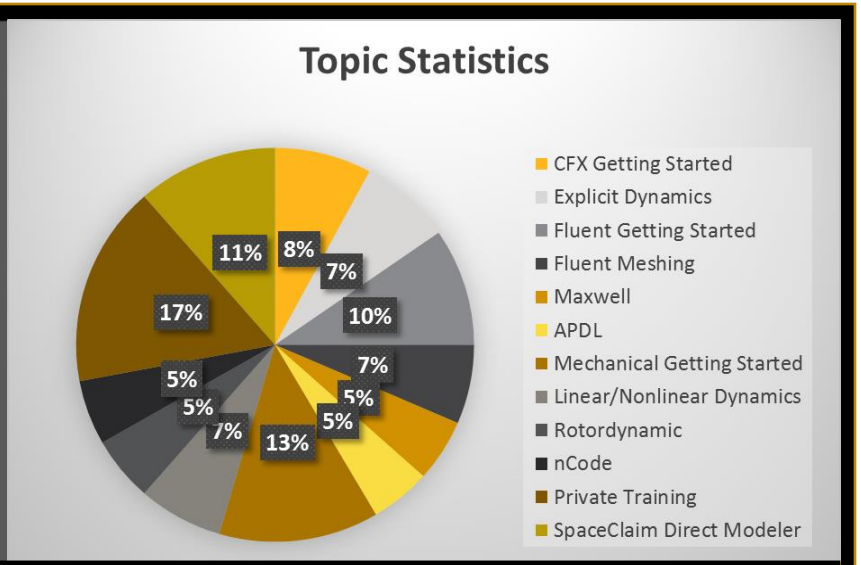
- Account and role specific learning paths streamlining the use of the ALH and giving guidance to relevant learning.
- Accumulated account specific learning and knowledge material from the Ansys account team.
- Knowledge sharing in internal forums.
- Possibility to upload and gather internal simulation best practice within the company.
- Possibilities for managers to monitor learning progress of the engineers within the private room.
- Payed customized e-learning modules to further streamline the learning paths and maximize productivity.



Ansys Learning Hub – Private Rooms and Customisation

Usage Report Driving Professional Development





Type	Metric Item	By 11/3/2017	By 12/4/2017	Avg.	Peer
Public	ALH Accounts	239	252	153	1039
	Total Hours of Live Lecture Training Taken	840 / 3.5 hrs.	937 / 3.7 hrs.	482 / 3.2 hrs.	5489 / 5.3 hrs.
	Total Self-Paced Course Modules Completed	196	220	223	3496
	Total # of Users Completed a Course / (%)	84 / 35%	90 / 36%	49 / 32%	289 / 28%
Private	Total Hours of Live Lecture Training Taken	831	831	337	1540
	Private Learning Room Visits	234	234	N/A	2252
	Private Learning Room Content Views	30	30	N/A	1089

	Thermal analysis for electronics (ICEPAK)	• Capable to handle types of heat transfer: Conduction, Convention and radiation: Combination of all modes of heat transfer • Import of mechanical 3D models: o Should be able to import CAD geometries from solid works, PRO_E. Auto Cad, etc. and should be able to cleanup and simplify the CAD models if needed. o Should be able to identify electronics objects from the imported CAD geometry and convert them automatically in native objects o Should be able to maintain bi-directional connectivity with CAD software's o Should be able to handle STEP, IGES, ACIS or Para solid formats. • Import for ECAD-and PCB models: o Should be able to import PCB models along with board, vias with layers connectivity from software's like cadence, Allegro, Cadstar etc. o Should be able to import gerber, gds, ODB++, AEDB files. o Should be able to import and model traces with complete details. o Creation of models: o Should be able to build components required for cooling of PCB along with details such as vias, layers, Packages, Sources, heat sinks, Vents, fans, filters etc. • Libraries: o Materials: ▪ Metals like aluminum, aluminum alloys, copper, nickel gold etc. should be available. The different types of material grades and conditions of aluminum namely HE30, HE 15 etc. to be available. ▪ Data base of non-metals like ceramics, polymers, laminates, glasses,minerals should be available. ▪ Components: Inbuilt package libraries like TO-220, SOIC, TO-241, SIP, DIP, FPGa's, CPLD's etc. to be provided. ▪ Thermo-Electronic coolers: Data base of single & multistage TEC to be provided. ▪ Data base of interface materials like thermal components (manufactures like 3M, Aavid, etc) to be provided. ▪ Heat sinks: Standard heat sinks of different manufactures like Aavid, Thermshield etc to be provided. Minimum of 500 No's of heat sink database to be provided. ▪ Database of two-resistor components to be available.

		▪ 2D & 3D heat source elements for power generation devices. ▪ Ability to create custom-built database and libraries to be provided. • Boundary Conditions o Import power maps in form of X, Y, Z, P. X, Y and Z are the coordinates and P is the heat flux • Meshing: o Provision of automatic & manual meshing to be available o Automatic meshing for fluid & solid regions to be available o Different type of mesh models like body fitted Cartesian mesh etc. to be available to represent complain shapes in the electronic model. o Ability to import external mesh in addition to native mesh • Post Processing: o 2D & 3D color shades of temperature at various planes and locations: Result at any particular point should be available even though monitoring points are not marked before start of simulation. o Ability to perform the post processing of multiple projects in single window for comparison o Ability to perform automatic post processing for similar cases in case of parametric trials. o Isosurface contours to locate min & Max variable quantities o Contours on various cutting planes (x,y,z & user defined planes). o Summary options to build custom summary reports o Automatic generation of summary report in MS office • Types of flow: o Laminar, transition & turbulent flows to be available o Ability to model multiple fluids to be available. • Simulation: o Transient, steady state and parametric analysis to be available o Joule heating in objects with temperature dependent properties supported o In case of transient simulation, ability to model variables as a function of time should be available. o Capability to parameterize all geometry details, material properties, boundary conditions and even make the objects active and in-active. o Ability to perform optimization on any of the variables like: material properties, object location, power

		dissipation, presence and absence, turbulence models, flow regime etc.
		
		• Materials:
		  ○ Constant and variable input material properties Variable resistance, temperature dependent resisting modeling.
		
		• Multiphysics Simulations:
		  ○ Bi-directional coupling with SIwave for electro-thermal analysis with automatic transfer of power dissipation on PCB along with temperature dependency on material properties
		  ○ Bi-directional coupling with Q3D, Maxwell, HFSS for node to node EM loss mapping and coupled electro-thermal simulation
		  ○ Bi-directional coupling with Mechanical for thermo-structural analysis
		  ○ Importing of Chip Thermal model powermap from Apache Redhawk for accurate power dissipation from chip level tool along with die level metal distribution

Specifications of Ansys LS-DYNA

- Solver Methods
  - ✓ Full 2D and 3D Capabilities
  - ✓ Nonlinear Dynamics
  - ✓ Rigid Body Dynamics
  - ✓ Explicit Analysis
  - ✓ Implicit Analysis
  - ✓ Quasi-Static Simulations
  - ✓ NVH, Fatigue and Frequency Domain Analysis
  - ✓ BEM (Boundary Element Method)
  - ✓ ICFD (Incompressible Computational Fluid Dynamics)
  - ✓ DEM (Discrete Element Method)
  - ✓ XFEM (Extended Finite Element Analysis)
  - ✓ Normal modes
  - ✓ Linear Statics
  - ✓ Thermal Analysis
  - ✓ Fluid Analysis
  - ✓ Eulerian Capabilities
  - ✓ ALE (Arbitrary-Lagrange-Eulerian)
  - ✓ FSI (Fluid structure Interaction)
  - ✓ Navier-Stokes Fluid
  - ✓ Compression Fluid Solver, CESE (Conservation Element & Solution Elements)
  - ✓ FEM-Rigid Multi-Body Dynamics Coupling (MADYMO, Cai3D)
  - ✓ Underwater Shock
  - ✓ Real-Time Acoustics
  - ✓ Implicit Springback
  - ✓ Multi-Physics Coupling
  - ✓ Structural-Thermal-Coupling
  - ✓ Adaptive Remeshing
  - ✓ SPH (Smoothed Particle Hydrodynamics)
  - ✓ SPG (Smooth Particle Galerkin)
  - ✓ EFG (Element Free Galerkin)
  - ✓ Radiation Transport
  - ✓ EM (Electromagnetism)
- Pre-Processing
  - ✓ Interactive Intuitive Interface
  - ✓ Integrated with solver and post-Processor
  - ✓ Wizard for Ease of setup
  - ✓ Visual Checking of Data
  - ✓ Data Checking During Model Creation
  - ✓ Comprehensive Restarting Capabilities: All valid Data can be Modified/Added/Removed at any stage
  - ✓ Material Data Libraries (250+)
  - ✓ Context-Sensitive Online Help
  - ✓ Enabling Keyword Commands
- Post-Processing

- ✓ Visualization for Large Datasets
- ✓ Interactive Intuitive Interface
- ✓ Integrated with Solver and Pre-Processor
- ✓ Animation wizard and Editor
- ✓ Stand-Alon Free Viewer for 2D and 3D Animations
- ✓ Contour and Isosurfaces
- ✓ Element Examine Probe
- ✓ Vectors
- ✓ Material Location and Status
- ✓ Gauge Time History plotting
- ✓ Part Histories
- ✓ Result Profile
- ✓ Multiphysics Result Visualization with LS-PrePost

- Parallel Processing
  - ✓ SMP, MPP and Hybrid Computation Technology
  - ✓ Single and Double Precision Solver
  - ✓ Windows, Linux, UNIX
  - ✓ Automatic Decomposition
  - ✓ User-Defined Decomposition
  - ✓ Scalable Solver
- Material Library
  - ✓ Metals
  - ✓ Plastics
  - ✓ Glass
  - ✓ Foams
  - ✓ Fabrics
  - ✓ Elastomers
  - ✓ Honeycombs
  - ✓ Concrete & Soils
  - ✓ Viscous Fluids
  - ✓ Composites
  - ✓ Cohesive Material Models
  - ✓ User-Defined Materials
  - ✓ Features In Material Models
    - ➢ Failure
    - ➢ Equation of State
      1. Linear Polynomial
      2. JWL
      3. Sack Tuesday
      4. Gruneisen
      5. Ratio of Polynomials
      6. Linear Polynomial with Energy Leak
      7. Ignition and Growth of Reaction in HE
      8. Tabulated Compaction
      9. Tabulated
      10. Ideal Gas

11. Phase Change
12. Gasket
13. MIE Gruuneisen
14. Murnaghan
15. User Defined EOS etc.

- ➢ Anisotropic
- ➢ Damage
- ➢ Unique Tension/Compression
- ➢ Thermal

- Boundaries and Loads
  - ✓ Initial Conditions
  - ✓ Translational Velocities
  - ✓ Angular Velocity
  - ✓ Gravity
  - ✓ Arbitrary Time Varying
  - ✓ Energy Deposition
  - ✓ Pressure
  - ✓ Point Load
  - ✓ Edge Load
  - ✓ Fluid/Material Flow Inlet
  - ✓ Fluid/Material Flow Outlet
  - ✓ Rigid Wall
  - ✓ Translational Velocity Constraint
  - ✓ Rotational Velocity Constraint
  - ✓ Angular Velocity Constraint
  - ✓ Blast Loads
  - ✓ Mask Loads for Forming Applications
  - ✓ Prescribed Boundary Conditions (Displacement Velocity and Acceleration)
  - ✓ Boundary Single Point Constrain
  - ✓ Reflecting and Non-Reflecting Boundary Conditions
  - ✓ Temperature Boundary Conditions
  - ✓ Ambient Boundary Conditions
  - ✓ Symmetry Boundary Conditions
- Element Library
  - ✓ Beams (Standard, Trusses, Discrete, Cables and Webs with over 10 Beam Element Formulations)
  - ✓ Discrete Elements (Springs and Dampers)
  - ✓ Lumped Inertial
  - ✓ Lumped Masses
  - ✓ Accelerometers
  - ✓ Sensors
  - ✓ Seatbelts
    - ➢ Pretensioners
    - ➢ Retractors

- Sliprings

  - ✓ Shells (3,4,8 and 8-Node including 3D shells, Membranes, 2D Plane Stress, Plane Strain, and Axisymmetric Solids with over 25 Shell Elements Formulations)
  - ✓ Solids (4 and 10-Node Tetrahedrons, 6-Node Pentahedrons with Over 20 Solid Elements Formulations)
  - ✓ SPH Elements
  - ✓ Thick Shells (8-Node)

- Contact Algorithm
  - ✓ Flexible Body Contact
  - ✓ Flexible Body to Rigid Body Contact
  - ✓ Rigid Body to Rigid Body Contact
  - ✓ Edge-To-Edge Contact
  - ✓ Eroding Contact
  - ✓ Tied Surfaces
  - ✓ CAD Surfaces
  - ✓ Rigid Walls
  - ✓ Draw Beads
- Support Tools- LS-PrePost, LS-OPT, LS-TASC, LS-Run
- Documentation
  - ✓ Context-Sensitive Online Help
  - ✓ User's Manual
  - ✓ Installation
  - ✓ Tutorials
  - ✓ Theory Manual
  - ✓ Release Notes