Design for Additive Manufacturing within the CREO Environment

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- Introduction to Additive Manufacturing (AM)
  - AM Techniques / ASTM Classification
- Benefits of AM
  - Geometric Complexity, Part Consolidation, Generative Design, Lattice Structures, etc.
- Design Guidelines for AM
  - Use topology optimization, Minimize residual stress, Optimize build direction, Avoid Local Minima, Select Feature orientation to avoid supports, Avoid re-coater crashes, Size fillets & chamfers, Shell and infill with lattices, Minimize support volume, Plan support removal, Plan mounting Fixtures, etc.
- Benefits of Heat Treatment for Residual Stress Relief and Hot Isostatic Pressing (HIP)
- Taxonomy of Lattice structures in nature & biomimicry. Lattice structure in CREO
- Create in CREO parametric on surface (i.e. iso-grid, Voronoi), 2 ½ D (i.e. honeycomb), 3D beam (i.e. Diamond, Octet) and 3D shell (i.e. Gyroid, Diamond, Custom) Lattice Structures
- Learn how to size and generate: full geometry, simplified or homogenized Lattice Structures
- Generating variable thickness and diameter lattice structures based on proximity to geometry or simulation results
- Create in CREO stochastic Lattice Structures such as Delaunay & Voronoi with variable spacing using 3 dimensional fields (i.e. Fields from Simulation or experimental results)
- Create custom unit cells for beam, 2 ½ D and solid Lattices
- Create Lattices on selected surfaces of parts
- Lattice Cell Homogenization and Topology Optimization process
- Learn how to simulate the structural, modal, thermal and fluid flow behavior of components with lattice structures using full geometry, simplified geometry of homogenized representations
- Optimize Lattice Structures using Behavioral Modeling and CREO Simulation Live. Perform sensitivity and optimization design studies
- Use CREO Generative Design to find the best distribution of material for stiffness
- Learn how to reconstruct the CAD geometry from the Generative Design results (Nurbification of faceted features)
- Learn how to perform Optimization of Print Orientation to minimize print time, support volume, down skin area, distortion, post-processing, etc.
- Complex Lattice structure interoperability with slice (*.CLI) and (*.3MF) files directly from CREO
- Tray assembly nesting and support generation within the tray assembly
- Create lattice supports within CREO using the down skin analysis features
- Combining Generative Design and Lattice Structures for Lightweighting

- Real time design exploration with CREO Simulation Live
- Energy Absorbing Lattice structures for ballistic protection
- Explore the validation and verification steps required for Aerospace & Defense applications
- Synthesize Metamaterials using Optimization & Custom Lattices. Design process for Architected materials (metamaterials) with the desired material properties (i.e., near zero coefficient of thermal expansion, auxetic metamaterials with negative Poisson's ratio, custom orthotropic properties, etc.
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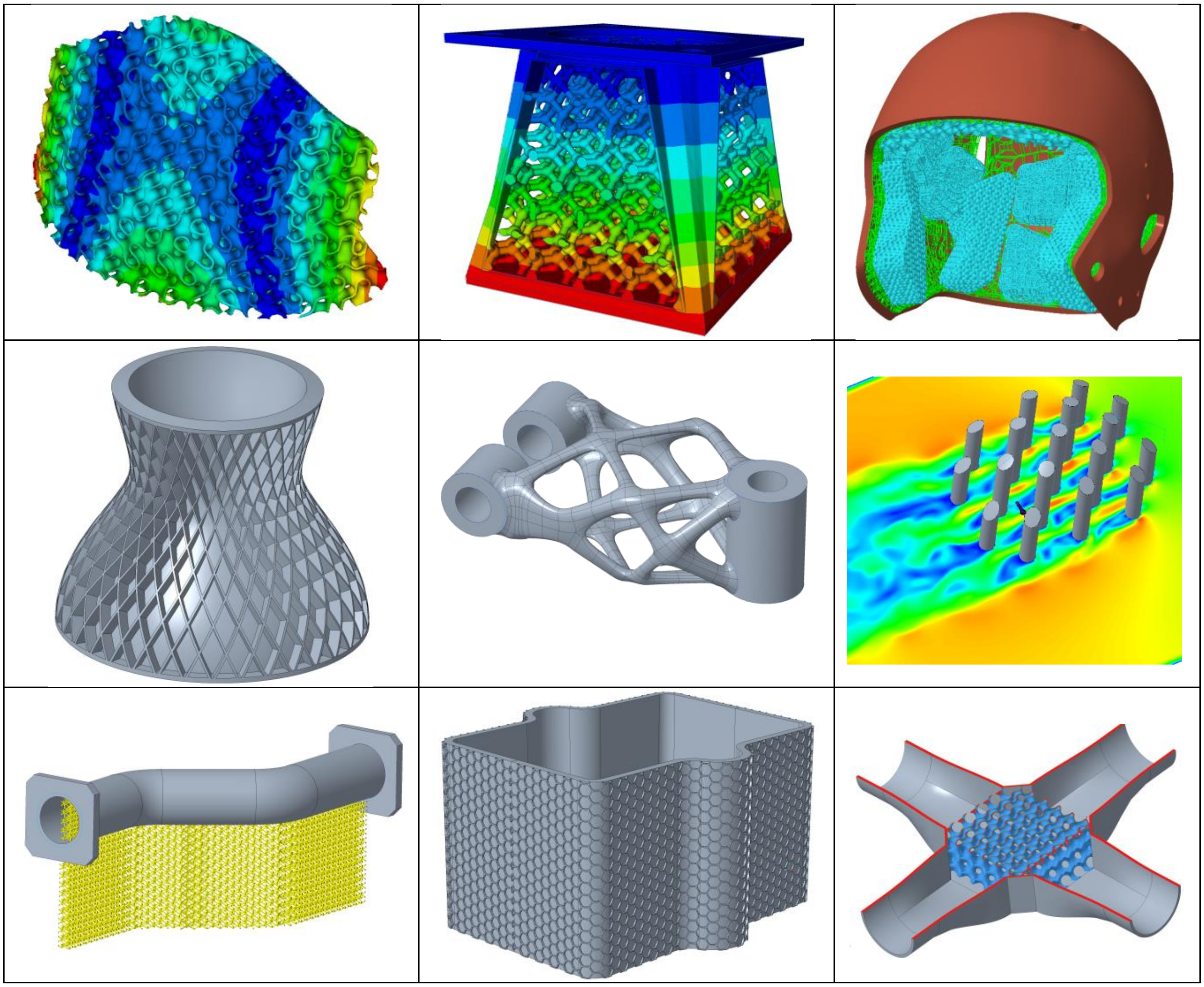

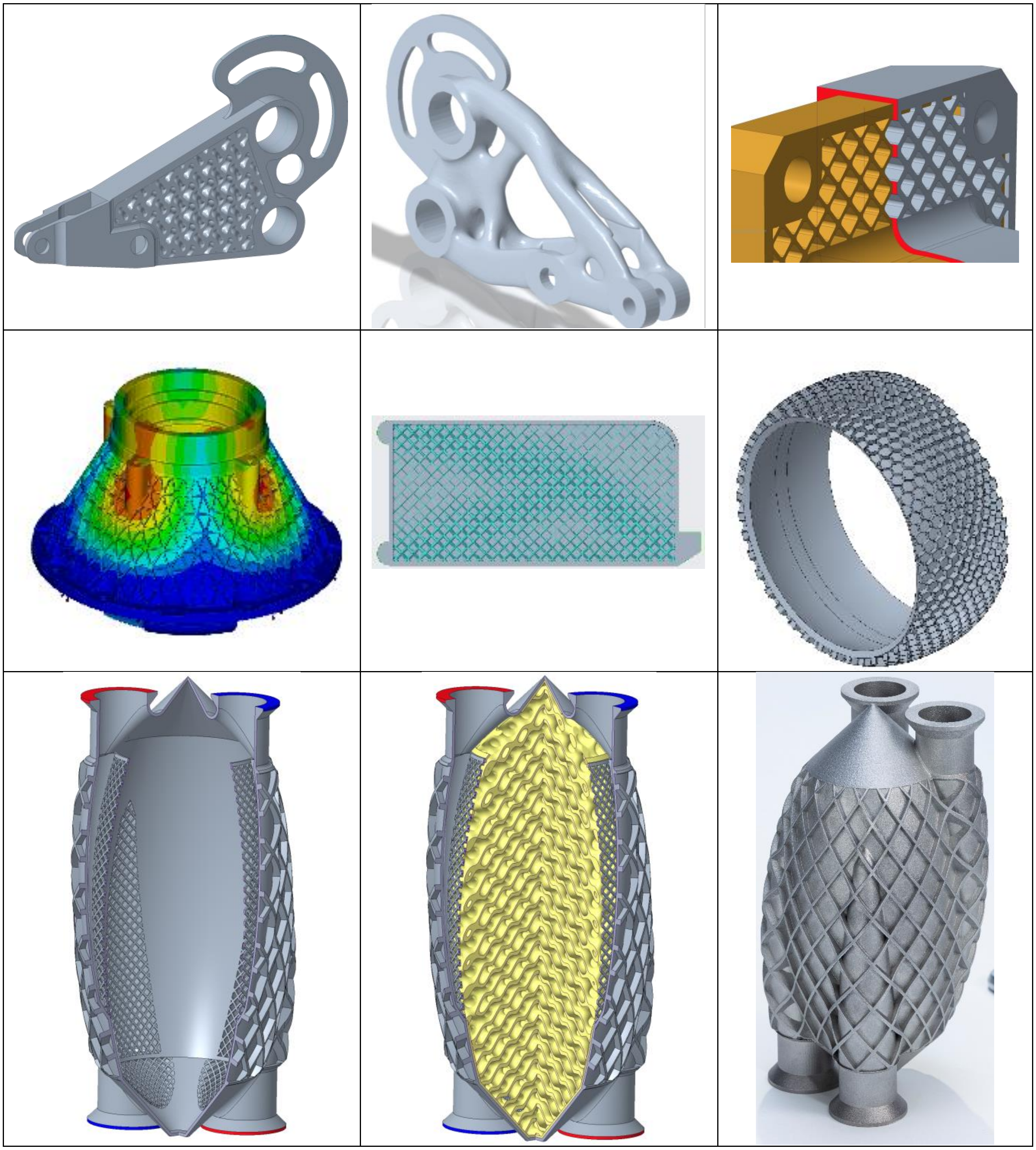

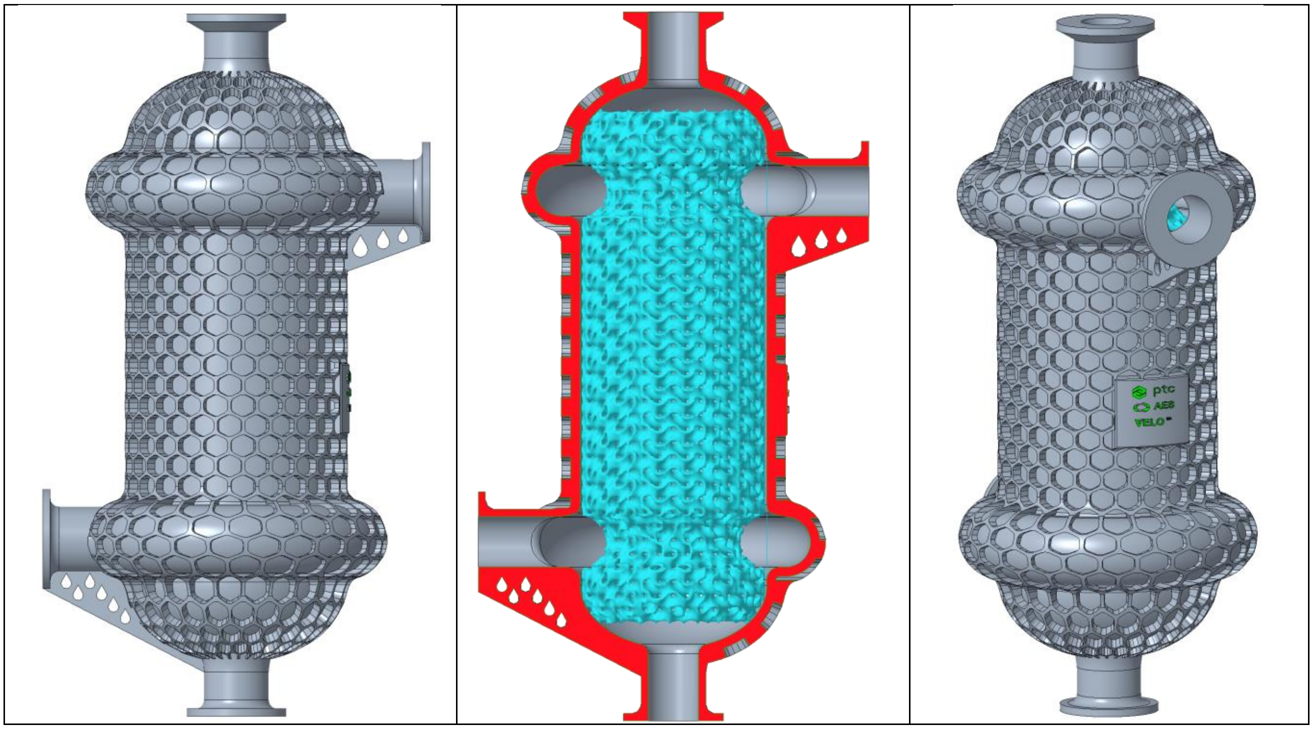

About the instructor:

Dr. Andreas Vlahinos is a CTO of Advanced Engineering Solutions. Andreas has concentrated on DfAM, Computer Aided Innovation, Generative Design, Lattice Structures, Simple Solutions to Complex Problems. He has been instrumental in rapid product development through the implementation of Design For Six Sigma (DFSS) and Computer Aided Engineering for several Government agencies such as NASA, NREL, SANDIA, DOE, NCDMM and US Army Aviation & Missile Command and industry partners such as IBM, Coors, Lockheed Martin, Alcoa, Allison Engine Comp., Solar Turbines, Ball, Futech, American Standard, Kohler, Varian, Stewart & Stevenson, Harris Corp., GENERAL DYNAMICS, TDM, PTC, MDI, Ford Motor Company, Rockwell Collins, BIC, BAE, XEROX, United Launch Alliance, SpaceX, Woodward Inc., Gichner Shelter Systems, NAVISTAR Defense, Flyer Defense, Viper Inc., Lincoln Composites, Advanced Composite Products & Technology, Inc., TetraPak, TOYOTA, Rafael Advanced Defense Systems, as well as several others.
He has been Professor of structural engineering at the University of Colorado teaching courses in Structural Mechanics and Computer Aided Structural Engineering. Several times he received the Professor of the Year Award, and he has published over 150 publications in areas of structural dynamics, design optimization and DFSS. He has received the R&D 100 award and several patents. He received his Ph.D. in Engineering Science and Mechanics from Georgia Institute of Technology. Finally, he is regularly invited as a keynote speaker on a variety of subjects (Generative Design, Innovation, DFSS, DfAM, IoT) in international conferences.