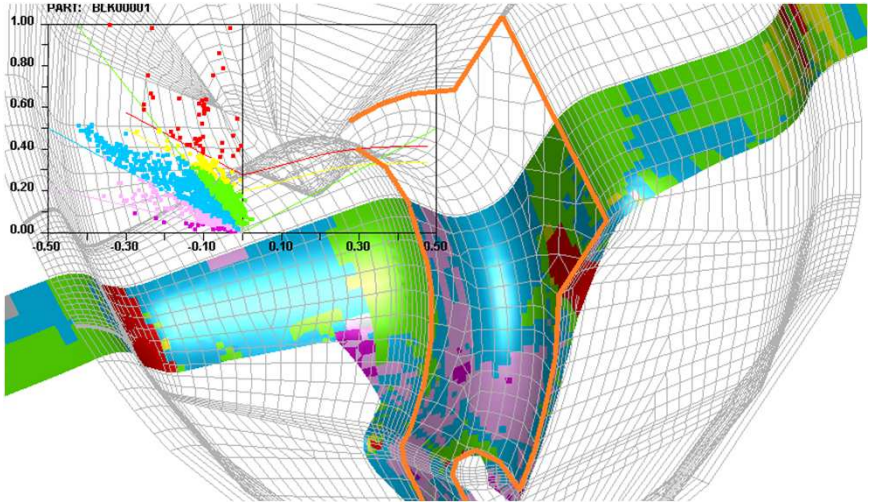
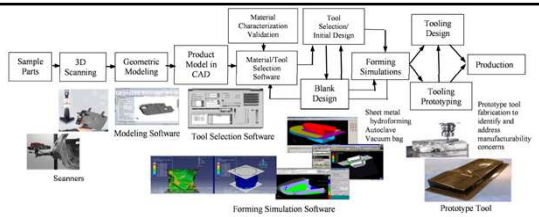
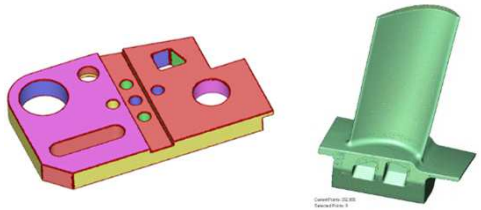
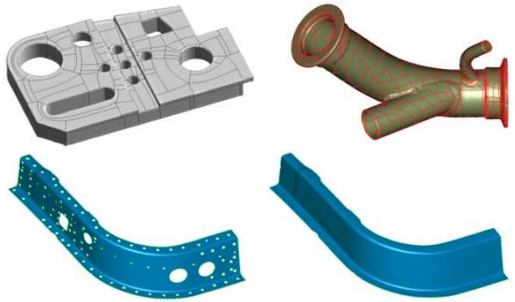
Reverse Engineering and Sheet Metal Forming for Aircraft Structural Repair Using Modern Engineering Tools



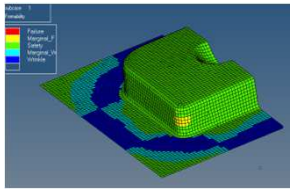
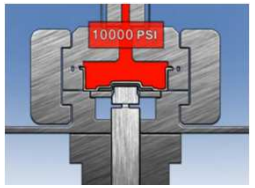
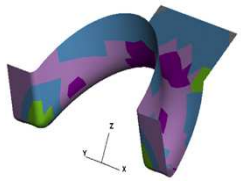
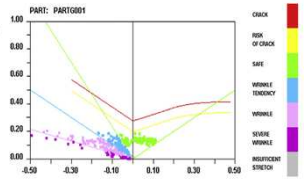
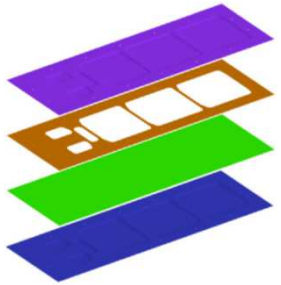
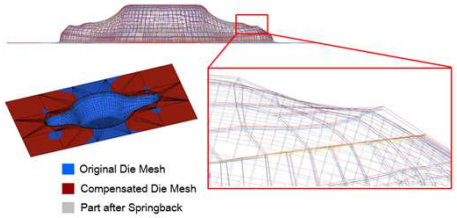
Course Outline

CAD Answers

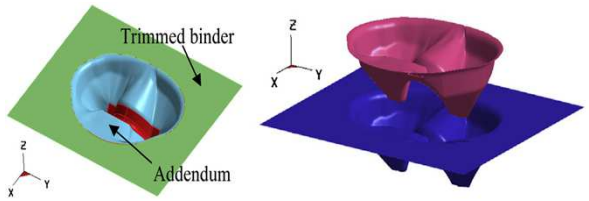
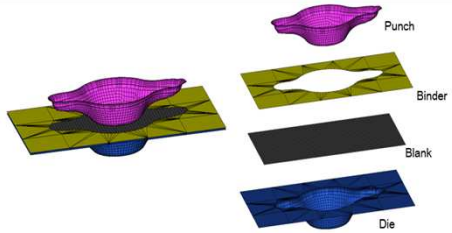
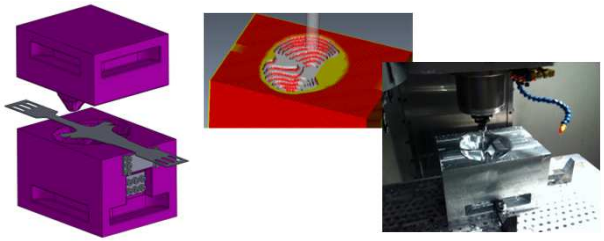
Course Plan—Day 1

Day 1	Lesson	Contents	Examples
Morning	1. Introduction and Overview of Sheet Metal Forming Manufacturing	• Course introduction • Overview: the integrated reverse engineering process for sheet metal forming manufacturing • Forming processes and equipment	
	2. Reverse Engineering: Scanning Devices	• Overview on the state-of-the-art 3D scanning technology • Basic technologies and equipment: laser, optical, tracking • Demonstration of ZScanner	
Afternoon	3. Reverse Engineering: Geometric Modeling Technology and Software tools	• Advanced surface modeling technology: triangulation, mesh segment, auto surfacing, and solid modeling • Overview on surface modeling software tools	
	4. RapidForm: Tutorial Lessons	• Introduction to RapidForm • Surface modeling examples • Parametric solid modeling examples • Air Force sample parts	

Course Plan—Day 2

Day 2	Lesson	Contents	Examples
Morning	5. Sheet Metal Forming	• Introduction: basic processes and equipment (draw forming, hydroforming, and stretch forming) • Sheet forming theory: principal strains, yield criteria, forming limit diagram, spring back and die compensation • Process planning and tooling design	 
	6. Formability Study and Die Design	• One-step formability study • Capabilities offered in HyperForm and DynaForm • Blank design and nesting • Die design, addendum design for smooth geometric transition	 
Afternoon	7. Forming Simulations	• Process parameters and material parameters • Tooling set up • Binder force • Creating a simulation • Simulation result visualization • Examples: core panel draw forming, tank holder hydroforming	  
	8. Spring Back and Die Compensation	• Basic concept: elastic deformation • Beam bending example for illustration of spring back calculation • Die compensation • Iterative design process	

Course Plan—Day 3

Day 3	Lesson	Contents	Examples
Morning	9. Introduction to DynaForm	• Overview of DynaForm • Basic capabilities of DynaForm • One step formability study • Blank design and nesting • Die and punch designs • Draw bead design	
	10. Forming Simulation using DynaForm	• Simulation process setup • Incremental forming simulation • LS-Dyna • Simulation animations • Thickness distribution • Stress distribution	
Afternoon	11. Tooling Manufacturing	• Die and punch designs • Introduction to CAMWorks • CNC machining simulation • NC toolpath generations • Post-processing • HAAS 3-axis CNC mill	
	12. Case Studies: Air Force Sample Parts	• Sample part: fuel line clamp • Hydroforming • Draw forming • Tooling design and manufacturing • Shop floor forming manufacturing • Review and wrap up