COMPOSITES TECHNOLOGY TRAINING FOR THE INDUSTRY

UAB offers short courses, workshops and a certificate in Composites based on a 6-sequence course offering. The course structure is flexible and can be tailored for different needs. The courses can be offered in a classroom setting or as web-based depending upon the needs of the industry.

C1. INTRODUCTION TO COMPOSITE MATERIALS
- Metals versus composites
- Fibers
- Polymers/Resins
- Foams and Honeycomb cores
- Interface
- Terminology
- Material forms (GMT, SMC, LFTs)
- Fabrics (2D, 3D, woven, braids, tapes)

C2. DESIGN AND ANALYSIS OF COMPOSITES
- Metals versus composites designs
- Stress-strain behavior
- Finite element analysis (Shells, Solids)
- Failure theories of continuous and discontinuous composites
- Design of Sandwich Composites
- Ribs, holes, cut-outs
- Strain rate sensitivity
- Mechanical joints and adhesives

C3. COMPOSITES MANUFACTURING
- Thermoset versus thermoset composites
- Thermoset composite processes
- RTM, VARTM, SRIM, RRIM
- Autoclave molding, Automated tape placement, Filament winding
- Compression molding, Thermoforming
- Long fiber thermoplastics / Extrusion-compression molding
- Pultrusion

C4. NONDESTRUCTIVE EVALUATION & QUALITY INSPECTION
- Probability of defects
- Process and service induced damage
- Visual inspection of composites
- Optical inspection methods
- Ultrasonic inspection for defects and material characterization
- X-ray radiography
- Vibration testing
- Acoustic impact and Acoustic emission
- Thermographic inspection
- Fiber optics sensors and smart materials
- Case studies for process and service-induced materials and structures

TEST METHODS
- ASTM, MIL Standards & ISO methods
- Static and Dynamic test methods
- Static tension, compression, flexure, interlaminar shear failure
- In-plane and out of plane tension & shear
- Fatigue testing
- Vibration testing
- Impact test methods – Low velocity, intermediate and high velocity impact

C5. APPLICATIONS DEVELOPMENT
- Integrated process and product development
- Tooling and Process implications
- Costing for Composites Products
- Material selection
- Structure-property relationships
- Design, analysis and development for Defense and Transportation applications

C6. COMPOSITE MECHANICS
- Micromechanics & macromechanics
- Rule of mixtures
- Weight to volume conversions
- Elastic moduli predictions for uni, bi- and multi-directional laminates
- Strength predictions for uni, bi- and multi-directional laminates
- Strength and elastic moduli of discontinuous composites

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