SASCOM Courses

Introduction to Composite Materials
Lectures Format

1st lecture, Nov 2, 2021

Time	Activity
5 min	Introduction
45 min	• Constituent materials, manufacturing processes and semi-products. • Matrices, fibers and interfaces. Role and selection of the constituents. • Properties of the constituents; effects of fiber sizing. • Semi-products: short-fiber, SMC, NCF, textiles and pre-pregs. • Examples of applications of different types of composite materials.
15 min	[audience interaction]
45 min	• Processes for thermoset-based composites: RTM, autoclave, resin infusion, pultrusion, filament winding. • Processes for thermoplastic-based composites: automatic tape laying, stamp forming. • Additive manufacturing of composite materials. • Effects of manufacturing defects.
15 min	[audience interaction]

2nd lecture, Nov 9, 2021

Time	Activity
45 min	• Mechanical behaviour and characterization. • Properties of composite systems and how to measure them. • Characterization of the mechanical properties of the constituents, fiber, matrix and interface. • Mechanical tests from coupon to sub-component: Building-block approach. Tensile and compression tests.
15 min	[audience interaction]
45 min	• Mechanical tests from coupon to sub-component: Building-block approach. Shear tests. Fracture toughness. Damage tolerance.
15 min	[audience interaction]

3rd lecture, Nov 16, 2021

Time	Activity
45 min	• Classical lamination theory. • Lamina and laminate stiffness.
15 min	[audience interaction]
45 min	• Invariant-based approach to stiffness. • Stiffness of symmetric laminates. • Stiffness of general laminates • Warpage.
15 min	[audience interaction]

4th lecture, Nov 23, 2021

Time	Activity
45 min	• Designing with composite materials. • Failure mechanisms. • Ply-based failure criteria. • Last-ply failure of multidirectional laminates. • Omni-envelope approach.
15 min	[audience interaction]
45 min	• Effects of stress concentrations. • Point- and average-stress methods. • Finite Fracture Mechanics. • Damage tolerance design.
15 min	[audience interaction]
5 min	Closing