

Composites Curriculum – Unit information

Taught block title	Product Design B	
Unit title	Stress analysis - classical	
Level (Credit points)		
Unit director	Dr. Hamed Yazdani Nezhad	
Unit description		
<p>The taught unit on Stress Analysis (Classical) comprises of mechanics of stress-strain fields, mechanical deformation and strain energy in fibre-reinforced composite materials and laminates in the presence of unidirectional and woven fibres architecture relying mainly upon the principles of material constitutive equations. The unit includes both elastic and elastic-plastic deformation, and excludes mechanics of damage.</p>		
Core subjects to be covered		
<ol style="list-style-type: none"> 1. Composite materials 2. Laminated composites 3. Concept of a continuum and continuity 4. Concept of homogeneity 5. Concept of isotropy 6. Elements of vector & transformation of axes 7. Matrix mathematics & tensor algebra 8. Direct strain & Shear Strain 9. General three-dimensional stress 10. Constitutive equation for composites 11. Deformation & strain tensor for composites 12. Viscoelastic effects 	<ol style="list-style-type: none"> 13. Stresses: Body and surface forces 14. Stress tensor, principal stresses & invariants 15. Stiffness calculations in composites 16. Strength calculations in composites 17. Conservation of energy 18. Definition of strain energy 19. Constitutive relations for elastic composites 20. Elastic-plastic composites 21. Concept of small scale yielding 22. Crack tip stress fields in composite 23. Techniques for structural analysis & design 	
Statement of unit aims		
<p>The aims of this unit are to:</p> <ol style="list-style-type: none"> 1. Provide Learners with classes and types of composite materials (particle or fibre reinforced) and laminates 2. Provide learners with theoretical estimation methods for composite stiffness, strain, stress & strength 4. Provide state-of-the-art techniques for composite stress analysis methods and composite structural design 		
Statement of learning outcomes		
<p>Learners will be able to:</p> <ol style="list-style-type: none"> 1. Categorise classes and types of composite materials and laminated composites 2. Estimate stiffness, strain, stress and strength of composite materials and laminates 3. Understand some of methodologies involved in design of composite structures 		
Methods of teaching	9 lectures, 1 class exercise	
Assessment details if required	Written assignment (85%), 20 minute assessed presentation (15%)	
Timetable information	2 days of teaching in a block	

