COMPOSITES CURRICULUM - Unit Information

This unit forms part of the Masters level Composites Curriculum developed by Bristol and Plymouth Universities.

Taught block title	Core Block
Unit title	Micromechanics
Level (Credit points)	H (2)
Unit director	Dr. Nuri Ersoy

Unit description

This unit forms part of the Masters level Composites Curriculum. It provides Learners with no prior experience with composites with a general introduction to the basic micromechanical methods to predict the thermomechanical properties of unidirectional composites from the corresponding properties of the constituents.

Core subjects to be covered

1. Review of thermomechanical properties of transversely isotropic materials
2. Predicting the composites properties using rule of mixtures
3. Predicting the composites properties using mechanics of materials approach
4. Predicting the composites properties using Self-Consistent Micromechanics
5. Predicting the composites properties using Representative Volume Elements and Finite Element Method
6. Comparison of the thermomechanical and strength properties using predictive micromechanical methods and experimental values

Statement of unit aims

The aims of this unit are to:

1. Review the engineering constants required to define transversely isotropic materials
2. Provide the learners with an overview of the concepts of micromechanical methods to predict the thermomechanical properties of unidirectional, transversely isotropic composites.
3. Provide the learners with an understanding of the causes of discrepancies of the predictions of the micromechanical methods and experimental values.
4. Give learners a feeling of how reliably the predicted values can be used in laminate design and analysis

Statement of learning outcomes

Learners will be able to:

1. Calculate the thermomechanical properties of the transversely isotropic materials using rule of mixtures, mechanics of materials approach and self-consistent field micromechanics
2. Able to construct Finite Element Models of Representative Volume Elements representing unidirectional, transversely isotropic composites.
3. Solve the Finite Element Models by assigning relevant boundary conditions and loads.

4. Interpret and assess the reliability the results of the predictions of micromechanical methods	
Methods of teaching	5 lectures, 3 FEA tutorials, 1 class exercise
Assessment details if required	Written assignment (85%), 20 minute assessed presentation (15%)
Timetable information	2 days of teaching in a block