

Taught block title	MANUFACTURING OPERATIONS A	
Unit title	Tooling Design and Manufacture	
Level (Credit points)		
Unit director	Martyn Jones/ Prof Richard Day	
Unit description		
This unit forms part of the Masters level Composites Curriculum. Its purpose is to describe and detail the materials, process and requirements in designing tooling for the manufacture of composite components.		
Core subjects to be covered		
<ol style="list-style-type: none"> 1. Overview of different manufacturing processes and the challenges in designing tooling for these applications. 2. Tooling systems for prepreg and fibre manufacture 3. Material selection in tooling design 4. Thermal endurance requirements 5. Conventional mould design 6. Advanced tooling design for pultrusion, filament winding etc 7. Consumables used for tooling materials with reference to release agents 	<ol style="list-style-type: none"> 8. Mechanisms in composite distortion during cure 9. Design to compensate for spring back of curved composites 10. Tolerance build up 11. Maintenance of tooling for composite components 12. Mould design using CAD (Catia Composites workbench) 13. Sustainable tooling design 	
Statement of unit aims		
The aims of this unit are to:		
<ol style="list-style-type: none"> 1. Allow learnings to critically assess the tooling material requirements based on material and cure properties 2. Develop a deep understanding of the phenomena that causes cure distortion and how tools are designed to compensate for this. 3. Understand the different manufacturing process and the tooling required for each method 4. How to use and maintain composite tooling correctly and sustainably. 		
Statement of learning outcomes		
Learners will be able to:		
<ol style="list-style-type: none"> 1. Have a systematic understanding of how to design tooling based on the manufacturing processes utilised 2. Critically evaluate how tooling can contribute to the form and geometry of the final component after cure 3. Develop a practical knowledge of tooling maintenance and operation process 		
Methods of teaching	6 lectures, 1 lab classes and demonstrations, 1 CAD session and 1 class exercise	
Assessment details if required	100% design task assessment	
Timetable information	3 days of teaching in a block	