

## COMPOSITES CURRICULUM - Unit Information

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

<b>Taught block title</b>	Manufacturing Processes B	
<b>Unit title</b>	Filament winding and pultrusion	
<b>Level (Credit points)</b>	M (2)	
<b>Unit director</b>	Professor John Summerscales	
<b>Unit description</b>		
This unit forms part of the Masters level Composites Curriculum. It introduces Learners to two important automated processes, Filament winding and Pultrusion. The course will be delivered from processing science and manufacturing engineering perspectives.		
<b>Core subjects to be covered</b>		
<ol style="list-style-type: none"> <li>1. The historical development of filament winding (FW)</li> <li>2. Winding pattern (hoop, helical or polar), geodesic path, Clairaut angle, and friction</li> <li>3. Software for filament winding design</li> <li>4. Basic principles of operation: increasing degrees of freedom</li> <li>5. Fibre feed arrangements and filament wetting</li> <li>6. Control, productivity and accuracy issues</li> <li>7. Thermoset matrix FW</li> <li>8. Thermoplastic matrix FW</li> </ol>	<ol style="list-style-type: none"> <li>9. Influence of process parameters on quality and conformance to design.</li> <li>10. The history and development of pultrusion</li> <li>11. Principles of part design for pultrusion</li> <li>12. Fibre preform management, and wetting, before die entry</li> <li>13. Consolidation and cure in the die</li> <li>14. Haul-off and section cutting</li> <li>15. Pulforming, pulwinding and pulbraiding</li> <li>16. Quality and costing for FW &amp; pultrusion</li> <li>17. Development areas and future research</li> </ol>	
<b>Statement of unit aims</b>		
The aims of this unit are to:		
<ol style="list-style-type: none"> <li>1. Provide Learners with an overview of the filament winding and pultrusion processes</li> <li>2. Provide the learners with information to support the design of composite products to be manufactured by filament winding and pultrusion.</li> <li>3. Identify the advantages and limitations of the processes</li> <li>4. Identify quality limiting aspects of the processes</li> </ol>		
<b>Statement of learning outcomes</b>		
Learners will be able to:		
<ol style="list-style-type: none"> <li>1. Provide a clear overview of the advantages and disadvantages of the filament winding or pultrusion processes for composites production</li> <li>2. Understand the features of the filament winding or pultrusion processes and how these may be simulated</li> <li>3. Understand some of the issues and methodologies involved in the selection and design of composites for manufacture by filament winding or pultrusion processes</li> </ol>		
<b>Methods of teaching</b>	7 lectures, 2 lab classes and demonstrations, 1 class exercise	
<b>Assessment details if required</b>	Written assignment (85%), 20 minute assessed presentation (15%)	
<b>Timetable information</b>	2 days of teaching in a block	