



# Project 1

<b>Project Name/Research Title</b>	<b>Composites repair and rework</b>
<b>Project Description</b>	<p>The application of laser tape placement of thermoplastic composite (TPC) materials to the reinforcement of metallic components could enable manufacturing of high-value, lightweight hybrid structures in a flexible and efficient process. Hybrid sheet metal/carbon fibre epoxy reinforced structures have demonstrated good crash performance for automotive structures and offer significant weight saving potential. Compared with conventional thermoset composites, TPCs are tough and typically have specific impact energy absorption an order of magnitude higher. One possible avenue for rapid and flexible manufacture metal/TPC hybrids is to adapt the near infra-red (NIR) laser automated (robotic) fibre placement (AFP) process, which can heat and consolidate TPCs in less than one second.</p> <p>This project will develop a production-viable AFP process for reinforcement of metallic components with automated placement of unidirectional TPCs. The research will include investigation of surface texturing of metal substrates for optimal laser absorption and metal composite bond quality; metal-composite interaction with possible adhesive inclusion and/or treatments; thermal modelling and measurements of the bond line temperature history to understand the effects of process parameter settings; and analysis of process constraints, limits of geometrical complexity for automotive part manufacture and cycle times.</p>
<b>Academic Expectations</b>	<p>The Ideal candidate will have the following qualities:</p> <ul style="list-style-type: none"><li>• Bachelor (Honours) or Master degree in Mechanical, Materials or Manufacturing Engineering; at 1st class or upper second class level, or equivalent.</li><li>• Demonstrated research capability (e.g. through thesis work ) in the area of fibre composite materials.</li><li>• Evidence of industry experience relevant to the proposed field of study.</li><li>• Demonstrated ability to create impact for industry partners.</li><li>• Highly developed design, analysis, experimental and modelling skills for composite materials.</li><li>• Highly developed interpersonal, communication and management skills.</li></ul>