



# Advanced Manufacture

Materials are a key component of the manufacturing process. These materials could range from the traditional such as light metals and super alloys to the new advanced multifunctional materials such as nanocomposites.

The Manufacturing and Laser Processing Research Group undertakes research on all aspects of the development of materials and the production methods and processing techniques for the low cost manufacture of new input materials.

Specific achievements and activity include:

- Innovative materials processing
- Composite manufacturing and modelling
- Digital manufacturing
- Micro/nano fabrication and synthesis
- Green/sustainable and additive manufacturing

- £2.5 million NWDA funded Northwest Laser Engineering Consortium. A collaboration between The University of Manchester and the University of Liverpool
- Laser machining of carbon and glass composites
- Laser-based surface cleaning technique for E-beam welding and diffusion bonding
- Development of laser drilling technology for turbines with improved fuel efficiency
- ECM drilling of deep holes in turbines

# Research areas

## Innovative materials processing

- Hybrid laser/non-laser processing
- Rapid additive manufacturing
- Laser cleaning of engineering materials
- Laser modification of wettability of materials
- Laser drilling
- Laser synthesis of nano-composites

## Composite manufacturing

- Pioneered 3-D woven carbon composite techniques
- Laser machining of carbon and glass composites

- Laser micro-machining of composite materials
- Ultra-scalable modelling of advanced composite materials with complex architectures
- Rapid manufacturing
- Laser additive manufacturing technology

## Digital manufacturing

- Product and process modelling
- Manufacturing process planning

## Micro/nano fabrication and synthesis

## Green/sustainable and additive manufacturing

# Research facilities

## Laser Processing Research Centre (LPRC)

- RoFin-Sinar RS-1000, 1 kW CO<sub>2</sub> laser processing system
- Electrolux, Scorpion 400W Nd:YAG laser 3-axis system
- LDL-160-1500 diode laser materials processing system
- Spectron SL402 Q-switched multiple-frequency Nd:YAG laser
- Spectra-Physics YHP40 Q-switched DPSS Nd:YVO<sub>4</sub> laser
- Diomed 120 diode laser 3-axis materials processing system
- Quantum Maxi-Mark III Q-switched Nd:YAG laser marking/engraving machine
- Lumonic 35LD 3-axis Nd:YAG laser machining system
- Spectron 100W CO<sub>2</sub> laser marking machine
- Powerlase 400W Q-switched DPSS laser
- IPG Singlemode YLR-1000-SM1 kW fibre laser

- GSI-lumonic IPEX800 excimer laser
- Femto second Ti-Sapphire laser

## Royce Laboratory

- MHP CNC lathe
- Takisawa CNC centre with MDSI open architecture controller
- Mikron HSM400 high speed milling machine
- Spacatron EDM
- 3D ECM
- In-process grinding machine wheel dressing EDM/ECM
- Micro-EDM
- Dimension STT 3D printer

# Relevant postgraduate study

## MSc in Advanced Manufacturing Technology and Systems Management

This programme is one of the most well-established of its kind in the UK, having evolved from the very successful MSc programme in Machine Tool Technology, and is regularly updated in line with subject developments and changing industrial practices.

## Research degrees

The School of Mechanical Aerospace and Civil Engineering is a leading provider of postgraduate research programmes on an international level and can lay claim to some of the most important discoveries in the field of engineering. Five broad academic themes, including manufacturing, are covered.

# Academic staff



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