Optical and Photonics Engineering

The Department of Engineering has a growing and diverse research group focussed on the development of new optical devices for applications in medicine, industry, science and defence. The group has interests in:

*High power near-infrared fibre lasers*

Fibre lasers are exceptional sources of laser radiation providing extremely bright light emission in a compact-sized and low maintenance optical arrangement. A fibre laser is a type of laser utilising an optical fibre as the resonant cavity which contains an active ion-doped core. The emitted high power laser light, with output wavelengths stretching from the visible to the mid-infrared, can be achieved when an optical fibre is pumped by semiconductor diode lasers. Once a population inversion is reached in the core, stimulated emission occurs corresponding to a particular electronic transition of that dopant species. The laser radiation produced is confined to the fibre core and the laser output power is linearly related to the pump power from the diode laser. The output beam characteristics are determined by the NA and waveguiding properties of the active ion doped core, which can easily be tailored to produce single-spatial-mode output. The Optics and Photonics Engineering Group has many projects for graduate students in this area.

*Highly efficient and high brightness sources of mid-infrared light*

The Optics and Photonics Engineering Group is one of the leading groups internationally in the field of mid-infrared fibre lasers. The mid-infrared is fundamental because all chemical and biological compounds that are relevant to our health, our security and the environment interact strongly with light at these wavelengths. The mid-infrared wavelength range remains one of the frontiers of modern science and engineering, with great potential for fundamental breakthroughs and new technologies. We are creating state-of-the-art fibre mid-infrared sources capable of broadband, high power and mode locked output at wavelengths longer than 2.5 µm. We have collaborations with leading groups in Europe and North America and we are establishing links with industry to exploit our technology. The Optics and Photonics Engineering Group has many projects for graduate students in this area.