

Topic: Investigation into the sources of uncertainty in the optical measurement of gears
Location: University of Nottingham

This project is to investigate, identify and quantify the sources of uncertainty in the optical measurement of gears, and to use the results found to improve the current practice for its evaluation. Gear features are envisaged for measurement in the project, as they are currently a challenge for optical (and any other) measurement and inspection methodologies. The current specification standards for the measurement of specific gear features are defined in ISO/TR 10064-1, which does not currently cover most optical inspection methodologies. This project may carry out the pre normative research to allow the standard to be updated and expanded. The project would initially seek to investigate and explore current practice and methods of calculating the sources of uncertainty in the optical measurement of gear / spline components. Good tactile gear measurement capability is available through the National Gear Laboratory, and this may allow for good correlation project activity work via a master gear. The writer intends to apply his knowledge of industrial designed experiments to investigate the cause-and-effect relationships of measurement uncertainty in optical (and tactile) gear measurement.

It is hoped that the findings of the project would lead to methodologies to both minimise the sources of uncertainty, by developing “good practice” for measurement, calibration, acceptance, and reverification of optical measuring equipment. It is also hoped that the findings may lead to recommendations for better methods for defining (or redefining) the acceptance criteria of other types of gear measurement equipment (CMM/GMM), by the application of analytical statistics in the verification process, in a way which currently may not be clearly defined or understood.

The project will be supervised by Prof. Richard Leach, from the Manufacturing Metrology Team (MMT). MMT is an international and diverse team that thrives on openness and cooperation – students work in teams to achieve joint goals in a friendly but professional cohort.

The position is available for UK candidates, but EU or International applicants who can pay the difference between the Home and International Fees would also be welcome to apply. Candidates must possess or expect to obtain, a high 2:1 or 1st class degree in mathematics, science or engineering, or other relevant discipline.

Supervisor: Professor Richard Leach



Richard is currently a Professor in Metrology at the University of Nottingham, Director of the Midlands Centre for Data-Driven Metrology, Head of the Manufacturing Metrology Team and prior to this spent 25 years at the National Physical Laboratory. He has been researching and lecturing on surface metrology for over 30 years. He is on the Council of the European Society of Precision

Engineering and Nanotechnology, the Board of the American Society of Precision Engineering and several international standards committees. He is the European Editor-in-Chief for Precision Engineering and has over 500 publications including eight textbooks. He is a Fellow of the International Academy of Production Engineering (CIRP), the Institute of Physics, the Institution of Engineering & Technology, the Higher Education Authority, the Institute of Measurement & Control, and the International Society of Nanomanufacturing. He is a visiting professor at Loughborough University and the Harbin Institute of Technology.