

## Research project and supervisory team

Supervisory Team	Supervisor Name <a href="#">Prof Saurav Goel</a> <a href="#">Prof Jim Greer</a>
Short introduction & description of research project	<p><b>Title:</b> Thermal, mechanical, and electronic behaviour of 2D materials during nanoindentation and nanoscratching in a chemical/electrical environment</p> <p>Two-dimensional (2D) materials, such as graphene, transition metal dichalcogenides (TMDs) and hexagonal boron nitride (h-BN), exhibit extraordinary thermal, mechanical and electronic properties, making them ideal candidates for next-generation nanodevices, flexible electronics and protective coatings. However, their performance in practical applications is critically influenced by their behaviour under mechanical, electrical and chemical stress at the nanoscale. This PhD project investigates the thermal, mechanical, and electronic responses of 2D materials during nanoindentation and nanoscratching in a chemical/electrical environment.</p> <p>By combined use of <b>atomic force microscopy (AFM) and molecular dynamics (MD) simulation</b>, the project will investigate fracture, plasticity, friction, and wear regimes of 2D materials in complex environments e.g., the energy inputs into the mechanical deformation process will be used to infer heat dissipation and heat losses to understand thermal properties. This integrated approach will allow for a detailed exploration of the interplay between mechanical stress, thermal transport and electronic properties in 2D materials. Key objectives include: (1) elucidating the deformation and failure mechanisms of 2D materials under nanoscale mechanical stress, (2) quantifying heat generation and thermal transport during mechanical loading, and (3) assessing the impact of mechanical deformation on electronic properties, such as carrier mobility and conductivity.</p>
Contact points	Prof Saurav Goel ( <a href="mailto:saurav.goel@nottingham.edu.cn">saurav.goel@nottingham.edu.cn</a> )