Department	School of Computing
Supervisors	Senthilarasu Sundaram
Project Title	**Textile wastewater removal using nanoparticle embedded graphene oxide membrane**

PROJECT DESCRIPTION

Graphene has remarkable hydrophobic properties which are ideal for wastewater treatment. Naturally, Graphene repels water, but allows permeation when there are narrow pores within it. Graphene or modified Graphene such as graphene oxide (GO) and reduced graphene oxide (rGO) sheets allow water molecules to pass but block the passage of contaminants and substances. Further research is required to understand the GO's impermeability to all gases and vapours and allow ultrafast separation of atomic species. The extremely thin nature of graphene means light weight and low-cost water filtration systems can be developed. Nano-MEM therefore aims to develop novel nanocomposite embedded GO and rGO as membranes for solar water treatment units for industrial effluent treatment. Development of such techniques can help support surface and ground water pollution reduction within the river basin, thereby promoting its sustainable development in developing countries.

The overall aim of the project is to develop and demonstrate a reilable, high efficient and cost effective graphene based nano materials embedded membranes for textile industrial water treatment plants. Following tasks will be undertaken during the studentship:

Task 1: The dye effluent related pollutants and characterisation will be done through sample collection from textile industries and the river basin in India **[M6-M12]**;

Task 2: Graphene and Graphene Oxide (GO) Membranes: GO is not as conductive as graphene, but the optimisation of pores can be used as membrane and low-cost alternative to graphene. Microwave assisted synthesis technique will be used along with KOH and $ZnCl_2$ to control the pore size **[M8-M18]**;

Task 3: Nanocomposite embedded rGO Membranes: Development of few layer graphene (FLG) based nanocomposites (Chitosan, noble metal and metal oxide nanoparticles) using microwave assisted techniques by varying the stoichiometry of activation agents and to investigate their structural and physiochemical properties. This involves synthesis and characterisation of GO and rGO membrane and Development and characterisation of Nanocomposite embedded rGO membranes **[M12-M28]**;

Task 4: Development of nanocomposite based rGO membrane to integrate with membrane-based wastewater treatment unit **[M24-M30]**

Task 5: Evaluation of P removal efficiency of the developed prototype in wastewater streams and Design and incorporation of the prototype scaling up into industrial scale treatment **[M30-M36]**

Task 6: Thesis writing and PhD submission towards, viva and required amendments to be before end of the project.

The candidate will have several trainings such as numerical analysis using COMSOL and Matlab for heat transfer analysis of the MD unit, and also will have experimental techniques such as SEM/TEM analysis for porosity measurements, solar simulators and quantum efficiency equipments for photovoltaic performance measurement and adaptive heat transfer measurements.

Academic qualifications

A first degree (at least a 2.1) ideally in Click here to enter text. with a good fundamental knowledge of Click here to enter text..

English language requirement
IELTS score must be at least 6.5 (with not less than 6.0 in each of the four components). Other, equivalent qualifications will be accepted. Full details of the University's policy are available online.

Essential attributes:

- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management

Enquiries	For informal enquiries about this PhD project, please contact Click here to enter text.
Web page	https://www.napier.ac.uk/research-and-innovation/research-degrees/application-process