**PhD Project Proposal**

School of Electronics, Electrical Engineering and Computer Science

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| **Proposed Project Title: In-situ Characterization of Nanomaterials** |
| **Principal Supervisor: Dr Hamza Shakeel Second Supervisor: Dr Neil Mitchell** |
| **Project Description:**  Consistent advancements in semiconductor fabrication techniques and the related characterization tools have pushed single transistor dimensions to sub 10 nano meters. We can now image sub nanometre dimensions primarily due to major scientific breakthroughs in developing scanning electron microscopy, transmission electron microscopy, scanning tunnelling microscopy and atomic force microscopy.  Recent interest in 2-D nanomaterials like graphene and especially heterogeneous growth of materials for emerging applications have opened up the need to characterize their critical mechanical properties. Although quartz crystal microbalance (QCM) has been widely used in semi-conductor industry for thickness monitoring but characterization of mechanical properties of deposited materials is not straight forward.  The objective of this PhD project is to develop asensor that can be used to characterize mechanical properties of thin films in real-time. The work will cover design, computational modelling, and testing of a novel silicon micro machined oscillator geometry. Student will also gain extensive experience of building a high-vacuum test platform.  The project will involve actively working with academic partners within/outside UK. Major part of the development work will be conducted at Queen’s Advanced Micro engineering Centre (QAMEC).  **Research Areas**: MEMS, Nanotechnology, Instrumentation, Sensors, Physics, Chemistry |
| **Contact details**  Supervisor Name: Hamza Shakeel Tel: +44 (0)28 9097 4083  QUB Address: 07.010 Ashby Building, Stranmillis Road Email: [h.shakeel@qub.ac.uk](mailto:h.shakeel@qub.ac.uk) |