Information on Postgraduate Research Scholarship - Ref: Eng-PhD-14-25			
Faculty:	Engineering and Science	**Department:**	School of Engineering
Lead Supervisor:	Dr Alexis Kordolemis		
Project Title:	Conformal thin film microdevices for the mechanical assessment and clinical diagnosis of the epidermis		
Project Description: (maximum 500 words)	It is well known that the human skin, which is the largest tissue of the human body, acts as a protective layer to a broad range of environmental agents, aggressive bacteria and various toxins. Furthermore, the skin is a living tissue which enables a sensory attribute on external physical stimuli, like heat, cold, and pressure. It has been verified experimentally that many skin diseases and related disorders, i.e. scleroderma, psoriasis and eczema, are closely related to its mechanical properties, i.e. the elastic modulus. Therefore, an in-depth understanding of the mechanical properties of the skin can play a central role in the development of low cost, innovative treatments. The aim of this project is to analyse in depth the mechanical response of the skin under externally applied mechanical loads which eventually will lead to the introduction of design methods of microdevices which can be attached to the skin and provide measurements of the elasticity in the regions near the surface of the epidermis. Essentially, these microdevices consist of a network of mechanical and electric actuators integrated within ultrathin, stretchable films attached to the external layers of the skin. In doing so, advanced theoretical models will be developed, and pertinent experimental validation will follow. The mechanics of the soft skin under in-plane mechanical loads can be analysed by adopting the model of a stiff film bonded on a compliant substrate. Under these circumstances, the bilayer of the film and the substrate will buckle forming wrinkles. Once the in-plane loads and hence, the compressive stresses reach a critical value various instability modes appear like cylindrical, square checkerboard, hexagonal and herringbone. In structures, buckling is assumed to be a failure mechanism that must be avoided. However, in stretchable electronics it has been well documented that these load-controlled buckling modes can generate interesting mechanisms that reveal the mechanical behaviour of the underlying structures. Due to the thinness of the film, which resembles the skin, the associated buckling modes will be analysed within the framework of non-linear elasticity. Advanced numerical simulations within finite element modelling will be undertaken to visualize the virtual response of the ultra-thin films capturing the expected buckling and wrinkling mechanics of the skin. The virtual test results will be validated against physical experiments based on the thin films under defined loading conditions. Therefore, the main objective of this study is to determine the critical loads for the different wrinkling modes of the bilayer and to investigate		

	the energy landscape of the system to specify the transition of one mode to the other upon the increase of the in-plane loading. The involved non-linearities of the system impose high sensitivity in the final mechanical response, thus advanced analytical and numerical techniques will be adopted to specify the favoured buckling mechanism as a function of the applied load and the mechanical properties of the film and the substrate. The impact of this research could have significant medical applications in skin condition monitoring and skin grafting. This scholarship is awarded competitively, and all applications are carefully reviewed. While we cannot guarantee an offer, we encourage strong candidates to apply.
Duration:	3 years, Full-Time Study or 6 years, Part-Time Study

Support available (subject to satisfactory performance):

A successful Home candidate will receive:

- A Full tuition fee waiver at the university Home-student rate for the specified duration of the scholarship

A successful International candidate will receive:

- A tuition fee waiver for 50% of the International-student rate for the specified duration of the scholarship.

Tuition fees are subject to annual increases.

This scholarship does not include funding for living expenses.

Person Specification of Essential (E) or Desirable (D) requirements:	
Criteria:	**E or D**
Education and Training:	
• 1st Class or 2nd class, First Division (Upper Second Class) honours degree or a taught master's degree with a minimum average of 60% in all areas of assessment (UK or UK equivalent) in a relevant area to the proposed research project	**E**
• For those whose first language is not English and/or if from a country where English is not the majority spoken language (as recognised by the UKBA), a language proficiency score of at least IELTS 6.5 (in all elements of the test) or an equivalent UK VISA and Immigration secure English Language Test is required, if your programme falls within the faculty of Engineering and Science a language proficiency score of at least IELTS 6.5 overall with a minimum of 6.0 in all elements of the test or an equivalent UK VISA and Immigration secure English Language Test is required. Unless the degree above was taught in English **and** obtained in a majority English speaking country, e.g. UK, USA, Australia, New Zealand, etc, as recognised by the UKBA.	**E**
Experience & Skills:	

• Previous experience of undertaking research (e.g. undergraduate or taught master's dissertation)	**E**
• Experience in advanced numerical techniques, i.e. variational principles, perturbation method	
• Strong programming skills in Python and/or Matlab or Mathematica	
• Having experience in writing research papers	
Personal Attributes:	
• Understands the fundamental differences between a taught degree and a research degree in terms of approach and personal discipline/motivation	**E**
• Able to, under guidance, complete independent work successfully	**E**
Other Requirements:	
• This scholarship may require Academic Technology Approval Scheme approval for the successful candidate if from outside of the EU/EEA	**E**
• The scholarship must commence before 15th July 2026 (offers will be withdrawn if this condition is not met)	**E**
Closing date for applications:	***midnight UTC on 20th February 2026***
For further information contact:	***A.Kordolemis@gre.ac.uk***

Making an application:

Please read this information before making an application. Information on the application process is available at: https://www.gre.ac.uk/research/study/apply/application-process. Applications need to be made online via this link. **No other form of application will be considered**.

All applications **must include** the following information. **Applications not containing these documents will not be considered.**

- **Scholarship Reference Number** ***)**– included in the personal statement section together with your personal statement as to why you are applying
- **a CV including 2 referees** *
- **academic qualification certificates/transcripts and IELTs/English Language certificate if you are an international applicant or if English is not your first language or you are from a country where English is not the majority spoken language as defined by the UK Border Agency** *

**upload to the qualification section of the application form. Attachments must be a PDF format.*

Before submitting your application, you are encouraged to liaise with the Lead Supervisor on the details above.