4-PANEPISTIMIO PATRON

EU RESEARCH FRAMEWORK PROGRAMME: Innovative Training Network "DECODE" (H2020-MSCA-ITN-956470)
RESEARCH FIELD: Biomedical Sciences and Engineering
RESEARCHER PROFILE: Early-Stage Researcher (ESR)
APPLICATION DEADLINE: 30/04/2021 (position will remain open until being filled)
LOCATION: Department of Mechanical Engineering, University of Patras, Patras, Greece
TYPE OF CONTRACT: 36 months
JOB STATUS: Full-time
HOURS PER WEEK: 40
OFFER STARTING DATE: Between 01/06/2021 and 01/12/2021 or depending on the national and international Covid-19 regulations

---

General objectives of the DECODE project

DECODE focuses on the training of young scientists on the use of drug-eluting devices to combat the burden of peripheral artery disease (PAD). DECODE will provide young researchers with excellent scientific, technological and complementary skills through a multidisciplinary training programme having as an outmost scientific aim the development, optimization, and assessment of a drug eluting balloon system for the improved treatment of PAD. The aim of DECODE is twofold: a) to enhance the competitiveness and research careers of young researchers at European level as after the completion of the programme they will be able to face current and future challenges on the domain of biomedical engineering, b) to convert knowledge, ideas and expertise from both the academic and non-academic sectors into a novel product which will improve the monitoring and treatment of patients suffering from PAD and their quality of life, providing thus a significant economic and social benefit.

For more information: (https://www.decodeitn.eu/)

Specific Information for the position

A position for a PhD candidate is open at the University of Patras in Greece, Department of Mechanical Engineering, Applied Mechanics & Vibrations Lab., (Director Prof. V. Kostopoulos).

The Applied Mechanics Laboratory (AML/UPAT) was founded in 1980 and is one of the oldest and most competitive in the University of Patras. Apart from the Academic staff, AML employs on a regular basis more than 40 highly skillful engineers (MSc, PhD), researchers, technical and administrative personnel. The laboratory majors in materials engineering (composites, biomaterials) and lightweight structures. It applies latest edge technologies such as computational modelling and simulation for materials design and optimization, Artificial Intelligence, additive manufacturing, Augmented Reality/Virtual Reality, Digital Twin in product design, structure analysis, and the development of new multifunctional and intelligent materials. AML/UPAT has a proven record in European research and technology development projects under the framework of FP6, FP7 and Horizon 2020 Programs. It collaborates with

recognized European University Labs, Research Institutes, and Industries, whereas presents significant academic publications and works.

The PhD candidate will explore the deployment of drug coated balloons (DCB), the delivery mechanism of DCB to arteries of heterogeneous/anisotropic tissue composition comprising healthy tissue, as well as regions of fibrous, fibro-fatty, calcified and necrotic core lesions, using the Finite Element Method and developing a computational model that simulates the delivery process and its dependence on process parameters. The successful candidate will be co-supervised at the development of a computational model that aims to achieve the abovementioned interaction between the drug-coated balloon and the human arterial tissue.

This project will contribute to the confrontation of Peripheral Artery Disease modern-day plague, giving answers to its high-mortality rates and serious cardiovascular implications within 1 year after the diagnosis demonstrating how the Finite Element Method can help physicians draw conclusions and form guidelines for the drug-coated balloon implantation process. This project will explore how the balloon surface interacts with the human tissue and delve into the transport of free drug using a time-dependent reaction-diffusion model and the bound, immobilized drug using the time-dependent reaction equation. To accomplish this, the successful candidate will develop state-of-the-art detail model using image processing and unsupervised clustering technique(s) to reconstruct the arterial geometry from a single, typical, patient-specific color image obtained from intravascular ultrasound-derived virtual histology. Parameters for increasing transport and binding of drug in arteries will be explored, such as tissue retention, applied pressure, pharmacologic properties, and time. Further to the optimization of these parameters for more efficient drug delivery, different surface micro-patterns of the balloon surface will be explored to locally increase the applied contact pressure between endothelium and micro-patterns and increase locally the drug delivery. The non-homogeneous delivery will also be explored for the optimization of the micro-patterns' configuration.

Upon completion of the PhD, the successful candidate will be uniquely equipped for high-demand careers within academia or industry, with desirable skills in:
1) Bioengineering including simulation methodologies, optimization algorithms, computer-assisted design, computational modelling
2) Segmentation of models from computed tomography, drug screening and statistical analysis.

The laboratory will provide the candidate with the appropriate lab, and computing facilities. In addition, the ESR will be able to follow specialization lectures at post-graduate level in biomechanics, composites materials, structure dynamics, materials computational modelling.

Several secondments and training to other consortium partners are planned in the fields of multi-scale modelling, polymeric excipients and drugs used in delivery systems and medical devices, clinical background to PAD as well as managing emerging risks in innovations and new technologies.

Additional Information

According to the EU rules for the ITN projects, the recruited researchers must comply with the following conditions:

- are, at the date of recruitment, **early-stage researchers** (i.e. NOT have a doctoral degree AND be in the first 4 years (full-time equivalent research experience) of their research career).
- are recruited under an **employment contract/equivalent direct contract** (i.e. other contract with equivalent benefits and social security coverage), including: sickness, parental, unemployment and invalidity benefits - pension rights and - benefits for accidents at work and occupational diseases.
- be employed for **at least 3 months and up to 36 months.**
- **be employed full-time.**
- work **exclusively** on the research training activities.
- must comply with the following **mobility rule**: not have resided in the country of the recruiting beneficiary for more than 12 months in the 3 years immediately before the recruitment date (and not have carried out their main activity (work, studies, etc.) in that country) — unless as part of a procedure for obtaining refugee status under the Geneva Convention. For beneficiaries that are international European interest organizations or international organizations: not have spent with the beneficiary more than 12 months in the 3 years immediately before the recruitment date.

Requirements

- You have a background in engineering, materials numerical modelling, mechanics of materials and structures.
- You are ambitious, well organised and have excellent communication skills.
- You are verbally and written fluent in English and have the ability to work effectively and collaboratively.
- You are an enthusiastic, self-motivated individual, who is willing to take part in personal skills training, international travel and public outreach activities.
- You have demonstrated commitment to high-quality research.

Application

Applications must contain the following documents:

- a personal (motivation) letter and curriculum vitae,
- a copy of degree certificates and associated certificates,
- a copy of degree projects and any previous publications,
- a proof of English language skills (European acknowledged certificate in English Language, i.e. Cambridge, TOEFL),
- two recommendation letters (or the names and email addresses of two references).
- Any other information that will support your application.

The documents should be sent to: kostopoulos@upatras.gr