



## **School of Computing, Engineering, and the Built Environment Edinburgh Napier University**

### **PHD STUDENT PROJECT**

#### **Funding and application details**

**Funding status:** Self-funded students only

**Application instructions:**

Detailed instructions are available at <https://www.napier.ac.uk/research-and-innovation/research-degrees/how-to-apply>

*Prospective candidates are encouraged to contact the Director of Studies (see details below) to discuss the project and their suitability for it.*

#### **Project details**

**Supervisory Team:**

- DIRECTOR OF STUDY: Libu Manjakkal (Email: [L.Manjakkal@napier.ac.uk](mailto:L.Manjakkal@napier.ac.uk))
- 2<sup>ND</sup> SUPERVISOR:

**Subject Group:** Cyber-security and system engineering

**Research Areas:** Physical Chemistry, Polymer Chemistry, Structural Chemistry, Electrical Engineering, Electronic Engineering, Energy Technologies, Integrated Engineering, Manufacturing Engineering, Mechanical Engineering, Mechanics, Mechatronics, Nanotechnology

**Project Title:** Soft Flexible and Stretchable Energy Storage Device Development

**Project description:**

Hybrid energy storage offers multiple advantages in electrochemical energy storage especially for portable electronic gadgets and autonomous systems due to its high energy and power density. 3D printing and additive manufacturing have potential impacts on the development of electrochemical energy storage devices. The porous electrode design using 3D printing will allow to achieve high electrochemically active area-based electrode development in hybrid supercapacitors. In this Ph.D. project, the student will develop the next generation

of hybrid supercapacitors using 3D printing technology for energy-autonomous systems. The electrodes will be developed in different sizes and shapes.

The anticipated activities are

1. Preparation of new 3D printable inks or pastes using composite materials
2. Design and development of active electrodes via 3D printing
3. Fabrication of hybrid supercapacitors and investigation of its energy storing performances

**References:**

## **Candidate characteristics**

**Education:**

A second class honour degree or equivalent qualification in electronics and mechanical engineering, physics, chemistry, and material science

**Subject knowledge:**

- Fundamental knowledge of materials and solid works for 3D printing .

**Essential attributes:**

- Experience of fundamental in materials, 3D printing and CAD design
- Competent in collaborative research work
- Knowledge of energy storage and 3D printing
- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management

**Desirable attributes:**

- Modelling and simulation