**Title**

Design of a mechanical energy storage and release module for body-powered assistive devices of the upper extremity

**Introduction**

Stroke patients may suffer from upper extremity impairments that reduce their arm and/or hand function such that daily activities cannot be performed. Assistive devices including hand exoskeletons or arm supports can support these patients. However, most of the currently available devices that restore upper extremity function require the use of an external electrical power source to actuate the impaired hand and/or arm, resulting in a complex, costly, and bulky design. Therefore, externally electrical powered assistive devices are hardly used in patients daily practice.

Body-powered actuation is widely used within the field of prosthetics. The control of body-powered prostheses is often achieved through a Bowden cable that directly couples motion of an intact joint to movement of a terminal device. This type of coupling is simple and inexpensive, but has several disadvantages when applied to stroke patients. For example, the required cable actuation forces may be high, causing fatigue of the involved muscles and discomfort of the controlling joint. Also, body-powered actuation may pose a heavy burden on the already overstrained, unaffected side of stroke patients. Hence, there is an unmet need for a body-powered actuation system which overcomes these limitations.

**Goal**

The goal of this assignment is to design and develop a purely mechanical system that uses hydraulics to store the energy that is manually ‘fed’ into the system by the patient, and provide a controlled release of this energy when the user needs to operate the terminal device of a hand orthosis or prosthesis.

On this basis, concepts of the mechanical energy storage and release module shall be elaborated and a functional prototype shall be designed, manufactured, and tested.

**Research outcome**

Literature research/ analysis; Conceptualization; Design in SolidWorks; Prototyping; Testing

**Keywords**

Body powered; Mechanics; Hydraulics; Orthotics; Stroke; Upper extremity

**Profile of the student**

We are looking for a student with a curious and engaging personality, who has a solid knowledge of Mechanics, Hydraulics, and Design, and has first experience with their application in previous projects.

