**Grad Students Positions**

**Hani Naguib: Smart Materials and Composite Lab**

**Conducting polymer based pressure Sensors for smart skin applications**

Human skin is the largest sensory organ in our bodies allowing us to safely maneuver within our surrounding environment. This physical barrier which enables us to interact with our physical world comprises several sense receptors through which information from a physical contact transduces into electrical signals. An artificial skin, also referred to as smart skin or electronic skin (e-skin), with human-like sensory capabilities can make a significant impact on the autonomous artificial intelligence as well as surgical tools. This can be achieved by providing a sensory perception even better than their organic counterparts. In addition to force sensing as the primary function of human skin, other functionalities such as mechanical/electrical self-healing along with flexibility/stretchability are of great importance to be considered in an e-skin. The project will investigate the design and fabrication of a pressure sensor mimicking the main characteristics of natural skin, potential of using conducting polymers as piezoresistive sensors for electronic skin applications.

**Development of smart materials actuator for soft robotics applications**

Electroactive polymers (EAPs) and Thermoactive polymers (TAPs) are materials that can undergo large amount of dimensional change and produce significant reaction force when a voltage or heat is applied to them. Among all types of EAPs and TAPs, conductive polymers and shape memory polymers are the most promising solutions due to its high response stress/strain that can be produced by the materials. The deformation is governed by the phase changing under different voltage and temperature which can be controlled via Joule heating. Currently, one of the major research focuses is on improving the strain and stress of different types of EAP/TAP during actuation. Objectives of the proposed project include: (i) design, fabricate, and characterize EAP and TAP materials, (ii) construct and characterize novel composites by combining or embedding EAP into TAP matrix, and (iii) verify the performance in terms of their actuation motion, including maximum displacement, curvature, and force response.