UCF | NanoScience Technology Center

UNIVERSITY OF CENTRAL FLORIDA

GRADUATE RESEARCH SEMINAR SERIES

Friday
March 9, 2018

12:00 PM

Research Pavilion
NSTC
Room 475

Pizza and drinks will be provided

3D Printing, Ink Casting and Micromachined Lamination (3D PICLμM): A Makerspace Approach to the Fabrication of Biological Microdevices

Avra Kundu
Dr. Swaminathan Rajaraman's Group

We shall present a novel benchtop-based microfabrication technology: 3D printing, ink casting, micromachined lamination (3D PICLμM) for rapid prototyping of lab-on-a-chip (LOC) and biological devices. The technology uses cost-effective, makerspace-type microfabrication processes, all of which are ideally suited for low resource settings, and utilizing a combination of these processes, we will demonstrate the following devices: (i) 2D microelectrode array (MEA) targeted at in vitro neural and cardiac electrophysiology, (ii) microneedle array targeted at drug delivery through a transdermal route and (iii) multi-layer microfluidic chip targeted at multiplexed assays for in vitro applications.

The 3D printing process has been optimized for printing angle, temperature of the curing process and solvent polishing to address various biofunctional considerations of the three demonstrated devices. We will see that the 3D PICLμM process has the capability to fabricate 30 μm sized MEAs (average 1 kHz impedance of 140 kW with a double layer capacitance of 3μF), robust and reliable microneedles having 30 μm radius of curvature and ~40 N mechanical fracture strength and microfluidic devices having 150 μm wide channels and 400 μm fluidic vias capable of fluid mixing and transmitted light microparticle visualization. We believe our 3D PICLμM is ideally suited for applications in areas such as electrophysiology, drug delivery, disease in a dish, organ on a chip, environmental monitoring, agricultural therapeutic delivery and genomic testing.