



# HUMAN-CENTERED **ROBOTICS** LAB

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## **WORKSHOP on the Utility of Wearable Sensors**

The main aim of the workshop is to introduce participants to field of Wearable Sensors and its utilization in relation to Bio-medical field. The workshop will allow participants to witness the on-going progress of wearable sensors and its utility in the field of Biomedical in general and Prosthetics in particular.

Introduction to Data acquisition with heterogeneous sensors, Data statistical analysis and reliability will also be a part of this workshop. This workshop will also cover the hands-on experience on the ESCON Studio software, motor tuning, utility of Inertial Measurement Unit (IMU) in Prosthetics, hardware interface using ESP 32 and its programming through Arduino.

Furthermore, allied technologies shall also be introduced, which include but not limited to CAD Modeling of Prosthetics, Application development using state-of-the-art commercial actuators, and control implementation of novel algorithm.

The following topics will be covered:

- Introduction to Heterogeneous Sensors,
- Data acquisition using Heterogeneous Sensors.
- Statistical Analysis and reliability of the acquired Data.
- Virtual Constraints Control Algorithm and its Simulations
- CAD Modeling of Active Knee-ankle Prosthetics and its mechanics
- Introduction to ESCON Studio, and motor tuning using ESCON studio and drivers
- Demonstration of IMUs and its challenges.
- Software-based and hardware-based filter's design and demonstration.
- Microcontrollers used
- Control schemes used in prosthetics
- Hands on experience of using IMU with the lower limb prosthetics and hardware interface using ESP 32.
- Demonstration of virtual constraints control of ankle knee prosthesis algorithm and motor control in gait phases using IMUs.