Project 1

Detection of Current Position using Magneto-Resistance Sensors Array

Project Overview:

The development of smart grid calls for pervasive deployment of current measurement in the power transmission and distribution system, serving for monitoring, control and protection purpose. The project aim is to employ magneto-resistance sensors to estimate the position of current under investigation. Multiple-axes magnetic field sensors will be used.

Requirements:

- Modeling of sensor Array electrically
- Mathematical analysis of sensor array measurements to estimate the position of the current under test

Eligible Departments:

Electronics	**X**
Communications	
Networking	

Software/Hardware:

Software tools required: Matlab and/or Mathematica, Spice/Cadence

Relevant References:

- Yafeng Chen, Qi Huang, Arsalan Habib Khawaja, Dongsheng Cai and Jie Wu "A novel non-invasion magnetic sensor array based measurement method of large current", Journal Measurement, Volume 139, June 2019, PP 78-84

Project 2

Design and Implementation of HW Demo for Dynamic Scheduling

(Co-supervised by Dr. Maggie Mashaly)

Project Overview:

In this project it is required to implement a HW Demo which reflects the current system status for an industrial factory. First it is required to build a model for the factory to resemble the machines and production lines using pre-implemented sensor modules that send data reflecting the machine's status. Data should be collected and stored in a cloud-based database. In the second phase the collected data should be used to implement a digital twin of the factory that is able to reflect all its live updates. Requirements:

- PCB and Sensor Boards Design
- 3D Design and Print of the industrial Factory workstations

Eligible Departments:

Electronics	**X**
Mechatronics	**X**
Communications	
Networking	

Software/Hardware:

Software tools required: Proteus, Spice, Eagle and Arduino Coding

Project 3

Non-Invasive Current monitoring PCB Design using Multiple-Axes Sensors

Project Overview:

The project aim is to design a PCB with multiple-axes magnetic field sensors for current monitoring. Three-axis Tunneling magneto-resistance sensors will be used to detect the magnetic field generated by the current under investigation. The readings of the sensors will be recorded and analyzed to differentiate between the readings of the current under investigation and the external magnetic fields (noise signals).

Eligible Departments:

Electronics	**X**
Communications	
Networking	

Software/Hardware:

Software tools required: Proteus

Hardware skills: PCB soldering and experimental testing

Relevant References:

- Yafeng Chen, Qi Huang, Arsalan Habib Khawaja, Dongsheng Cai and Jie Wu "A novel non-invasion magnetic sensor array based measurement method of large current", Journal Measurement, Volume 139, June 2019, PP 78-84

Project 4

Neuromorphic ICs: Survey Study

Project Overview:

Neuromorphic computing has come to refer to a variety of brain-inspired computers, devices, and models that contrast the pervasive von Neumann computer architecture. This biologically inspired approach has created highly connected synthetic neurons and synapses that can be used to model neuroscience theories as well as solve challenging machine learning problems. The promise of the technology is to create a brain-like ability to learn and adapt, but the technical challenges are significant, starting with an accurate neuroscience model of how the brain works, to finding materials and engineering breakthroughs to build devices to support these models, to creating a programming framework so the systems can learn, to creating applications with brain-like capabilities.

In this thesis, a survey of the major research areas in the ASIC design field that supports this technology.

Requirements:

- Survey on devices used for NN computation
- Analytical and Simulation studies of the ICs used for NN computation

Eligible Departments:

Electronics	**X**
Communications	
Networking	

Software/Hardware:

Software tools required: Cadence (Virtuoso and Layout Verification)

Relevant References:

- Catherine D. Schuman, Thomas E. Potok, J. Douglas Birdwell, Mark E. Dean, Garrett S. Rose and James S. Plank, “A Survey of Neuromorphic Computing and Neural Networks in Hardware”,