

# Microsystems and Smart Sensor Interfaces

Course Code :

Credit Hours : 3 + 0

Pre-requisites : Analog Integrated Circuit Design

Target Audience : MS/PhD Students willing to pursue integrated circuit design to applied level from sensors and transducers perspective

## **Synopsis**

This course will focus on the readout integrated circuit design for micro-electro-mechanical and micro-opto-electrical sensors. Such an interface is inherently analog at the its front-end and therefore its design would require in-depth knowledge of analog integrated circuits. This course would attempt to follow the current trend of more-than-Moore in which the micro-dimensioned sensing element is either monolithically or in a hybrid manner present with its readout electronics in the same die or in the same package. Readout circuits for capacitive and piezo-resistive MEMS would be designed starting from a brief study of the associated sensor from the reference books. Similarly, readout circuits for visible, infra-red and Tera-Hertz imagers would be designed for thermal and photoconductive modes. Due to its versatile nature, this course would extract material from several reference books and would not strictly follow a single text book.

## **Brief Course Outline**

- Evolution of Sensors to the Micro and Nano Regime
- More-than-Moore, System-in-Package and Monolithic Integration of Sensor Systems
- Overview of MEMS sensors, extraction of their key parameters and specs
- Design of readout-interface for MEMS sensor achieving the specs
- Overview of Visible, Infra-red and Tera-Hertz Imagers
- Readout Circuit Design for above-mentioned opto-electrical sensors

## **Instructor**

This course would be carried out by Syed Arsalan Jawed ([arsalan.jawed@pafkiet.edu.pk](mailto:arsalan.jawed@pafkiet.edu.pk)). He received his PhD in 2009 and has worked on MEMS and opto-electrical sensor interfaces along with high-speed differential IOs. He has worked with renowned organizations such as ST Microelectronics, Analog Devices, NESCOM and Open-Silicon Inc.

## **Reference Books**

MEMS: A Practical Guide to Design, Analysis, and Applications, Jan Korvink, Oliver Paul, 2005

Ultra Low Power Capacitive Sensor Interfaces, Analog Circuits and Signal Processing Series, Bracke, Wouter, Puers, Robert, Van Hoof, Chris

Smart CMOS Image Sensors and Applications By Jun Ohta, CRC Press

Medical Imaging: Principles, Detectors, and Electronics, Krzysztof Iniewski (Editor), Wiley.

Infrared Detectors, Second Edition, By Antonio Rogalsk