

Einladung des Instituts für Elektronische Sensorsysteme  
zum **Gastvortrag** am **15.03.2018** um **10:30 Uhr**  
im Hörsaal i6, Inffeldgasse 25D/1.OG, 8010 Graz

## **INSTRUMENT-ON-CHIP FOR IMPEDANCE TRACKING ON MICRO-SENSORS DOWN TO ZEPTOFARAD SENSITIVITY**

In the vast realm of sensors, one possible way to detect external physical quantities is to detect and track with time the variation of impedance that they produce on a suitably designed “sensing device”. The counting of biological cells when passing through the metal plates of a miniaturized capacitor is a simple example as well as the detection of magnetic beads by tracking the variation of a magnetoresistive multilayer. The requirement in sensitivity posed by scientific or industrial applications is often very high and can be possibly obtained only by integrating the sensor and the reading electronics into a single miniaturized chip thus optimizing their coupling. This seminar will highlight the main sources of noises in systems devoted to the measurement of electrical impedance and shows how indeed zeptoFarad sensitivity in the measurement of a capacitance can nowadays be achieved.

The seminar will specifically report on two reference applications where

- i) a contactless measurement of the conductance of a Silicon waveguide is used to detect, track and control the local amount of optical power in a Si-photonics circuit without interfering with the optical traveling field
- ii) the measurement of the capacitance between planar electrodes is used by an integrated circuit to detect the deposition of dust particles down to  $1\mu\text{m}$ , paving the way for a pervasive and distributed air-quality management control.

### **Biography:**

Marco Sampietro is full professor of Electronic Circuits and Devices at the Politecnico of Milano, Italy. He is co-author of more than 200 peer-reviewed international publications and holds 5 patents. He has been the coordinator of many national and international research projects and scientific partner in six large-size European projects within the FP6 (SPOT-NOSED and NOSCE MEMORIAS), FP7 (EXCELL and BOND) and HORIZON2020 (STREAMS, TRAINING4CRM). He is currently responsible for the activities in the field of high-sensitivity instrumentation for the nanoscience, with focus on the design of electronic integrated circuits for the measurement of currents, voltages, impedances and noise. Recently he co-invented a new class of light probes to monitor, track and feedback control the working point of optical micro-integrated devices and has coordinated the activity on the electronic system platform to exploit these probes on complex photonic architectures.