Industrial Co-Teaching (ICoT) Course

On

MEMS Technology

Co-ordinator : Mr.K.Sathishkumar

Co ordinating Department : Mechanical and Automation Engineering & Mechatronics

Supporting Industry : Firstcall automation private limited, Maduari.

The micro-electro-mechanical systems (MEMS) certificate program is designed to develop graduate-level expertise in a variety of cutting-edge areas, including materials and manufacturing techniques for microelectronics, and MEMS devices and transducers. Deepen your expertise in this exciting high-tech field by acquiring advanced technical skills and exposure to the latest technologies.

Micro-electromechanical Systems (MEMS) are the examples of integration of mechanical elements with sensors, actuators and electronics through a variety of micro fabrication tool kit. MEMS based devices have been developed and are being developed for the applications in various sectors such as consumer, medical, defense, space, communication etc. The MEMS market is still one of the fastest growing zones of the semiconductor industries. This course on MEMS will cover a wide range of topics right from the fundamentals to applications.

Course objectives:

- ✓ Fundamental basis of MEMS/NEMS.
- ✓ Overview of basic microfabrication processes.
- ✓ Bulk and Surface micromachining.
- ✓ Polymer and Carbon MEMS.
- ✓ MEMS design, modeling and simulation.
- ✓ 3D Integration.
- ✓ MEMS-based sensors and actuators.
- ✓ Comprehensive hands-on experience of MEMS Experiment.
    - ➢ Design and simulation of microcantilever beams and diaphragms
    - ➢ Wafer cleaning
    - ➢ Photolithography (resist spin coating, exposure, development)
    - ➢ Silicon micromachining
    - ➢ Fabrication of suspended MEMS structures (e.g. microcantilever, diaphragm, etc.)
    - ➢ Fabrication of SU-8 MEMS Structures
    - ➢ Polymer and carbon based MEMS structures using soft-lithography

5TH SEMESTER

Module 1 : **MEMS Fabrication & Materials** Mentor 1: Mr.S.Senthilraja

- ✓ Overview of Microelectronics and MEMS Technology
- ✓ Basic fabrication knowledge: Lithography, oxidation, chemical vapor deposition, dry etching.
- ✓ MEMS processing: Bulk micromachining.
- ✓ Surface micromachining
- ✓ Basic MOS circuit design and fabrication
- ✓ CMOS BJT Integration
- ✓ MEMS/Circuit Integration
- ✓ MEMS vacuum packaging
- ✓ Process magic
- ✓ *Case studies:* Microfluidic devices for biomedical applications

6TH SEMESTER

Module 2 : **MEMS and Sensor Technology** Mentor 2: Mr.P.T.Yogarajan

- ✓ MEMS Applications in automotive industry
- ✓ Applications in biomedical industry
- ✓ MEMS processes
- ✓ System Integration Technologies
- ✓ Hybrid Macro-Micro Systems
- ✓ Microactuation Mechanisms
- ✓ Electrostatic Actuation
- ✓ MEMS Simulators
- ✓ Advanced Micro Systems Fabrication Technologies
- ✓ Future of MEMS

7TH SEMESTER

Module 3 : **Micromachined Transducer** Mentor 3: R.Karikalan

- ✓ Silicon-based micro-machined transducers
- ✓ Micro-sensors
- ✓ Micro-actuators
- ✓ Micromachined ultrasonic transducers
- ✓ Imersion transducers
- ✓ Capacitive Micromachined Transducer
- ✓ Calibration of transducer
- ✓ CMUT operations
- ✓ Case Studies
- ✓ Design projects