MEMS & NEMS: Fundamentals, Design and Fabrication

From **Dec 17-22, 2018**

Over View: Indian Institute of Technology Hyderabad organized a 6 days TEQIP workshop on the design and fabrication aspects of Microelectromechanical Systems (MEMS) and Nanoelectromechanical Systems (NEMS) with a special focus on experimental hands on session. This workshop was well organized to cover vital aspects of MEMS & NEMS Technologies like the various micro-nano fabrication methodologies, challenges and means to overcome them, the design and modelling aspect, the three dimensional integration of Integrated Circuits etc. Apart from imparting the theoretical knowledge, this workshop also included the 4 days hands-on experimental sessions where the participants were trained to operate the state-of-the art laboratory equipment and get practical expertise of various fabrication and characterization methodologies. The hands on training (experimental) included the design of various MEMS/NEMS structures, fabrication of MEMS/NEMS structures using photoresists, transfer of pattern into polymers using soft lithography, and wet etching to develop the suspended structures.

Modules:

Description of the experimental hands-on-session

1. Silicon based microfabrication using wet-bulk micromachining at the MEMS and Micro/Nano Systems Laboratory.
2. Carbon based nanofabrication at the Chemical Engineering Research Laboratory.
3. Electrical and Mechanical Characterization of MEMS Sensors and Actuators at the Sensors and Actuators Laboratory.

MEMS and Micro/Nano Systems laboratory:

- spin coater to coat the photoresist on the silicon wafer,
- pre-baked them in the hot oven,
- transferred the patterns under UV rays,
- developed the patterns in the developer solution
- post baked them and used TMAH and KOH to etch and release the structures.

Chemical Engineering Research Laboratory:

- Preparing Compact disk for Lithography:
- Remove the aluminium foil layer from the CD using a cutter and a sticking tape carefully.
- Make a border around the objective area using the sticking tape
- Preparing PDMS film
- SU-8 patterns on silicon wafer and Canna Indica flower petal replicas

Sensors and Actuators Laboratory:

- Demonstrated the working of various instruments like oscilloscope, function generator, spectrum analyzer, vibrometer etc.
- Demonstrating methods to find the natural frequency, damping, frequency response, time signal, FFT of various structures and input signals.
- The Polytec Scanning Vibrometer (PSV) software was used to analyze various micro structures like single cantilever, arrays of cantilevers, diaphragms etc.

Following topics to be covered:

1. Fundamentals of Silicon based MEMS 2. Dry and Wet Etching
3. Polymer and Carbon based MEMS & NEMS 4. Bio-MEMS
5. MEMS Design 6. MEMS and NEMS in Sensors, Healthcare and Energy
7. Fabrication of MEMS & NEMS in Silicon, Polymer and Carbon

You Should Attend If….

Faculty from TEQIP supported academic institutions from Physics/Chemical Engg./Materials Science and Engineering/Mechanical/Electrical Engg./Biomedical Engg.subjects

Fees:

For TEQIP Participants its free of cost.

Dr. Prem Pa is the Professor in the Dept. of Physics at IIT Hyderabad.

Dr. Ashok Kumar Pandey is the Associate Professor in the Dept. of Mechanical & Aerospace Engineering at IIT Hyderabad.

Dr. Chandra Shekar Sharma is the Associate Professor in the Dept. of Chemical Engineering at IIT Hyderabad.

Prof. Kazuo Sato is the Professor Emeritus of Nagoya University Japan and Professor at Aichi Institute of Technology Japan

Prof. Prof. Hiroshi Tanaka is Professor at National Institute of Technology Japan.

Prof. Eyal Buks is the Professor at Technion-Israel Institute of Technology, Israel.

Dr. Shiv Govind Singh is the Professor of Electrical Engineering, IIT Hyderabad.

Dr. Siva Rama Krishna Vanjari is the Associate Professor of Electrical Engineering, IIT Hyderabad.

Course Co-ordinators

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