

## **ADVANCED SENSORS**

**Code : EI 503B**

**Contacts : 3L**

**Credits : 3**

### **Module I**

Principle of physical and chemical transduction; sensors classification, characterization of mechanical, electrical, optical, thermal, magnetic, chemical and biological sensors; their calibration and determination of characteristics; [3]

Sensor reliability, reliability models and testing, ageing tests, failure mechanisms and their evaluation, stability studies: [2]

### **Module II**

IC technology used in micro sensor system; Crystal growth and wafer making, oxidation lithography, masking, pattern generation and transfer, different types of etching, ion implantation and diffusion, and vacuum evaporation, assembling, packaging, micromachining, epitaxy, use of polysilicon materials, bonding of different types etc. [7]

Sensor designing and packaging: Partitioning, Layout, Technology constraints, scaling, compatibility study. Examples of selected micro sensors [4]

Thick Film process of sensor development, thin film techniques, Characterization and delineation, Langaur- Blodgett films, sensors developed using these techniques such as gas and ion sensors [4]

Ceramics and oxides as sensor materials, materials like Zirconia, Alumina, semiconductors, oxides of Tin & Zinc, Piezoelectric, Pyroelectric, Ferro electric materials. [3]

### **Module III**

Sensors for different applications: Mechanical, Electrical, Thermal, Magnetic, Optical, radiation chemical and Biological types. [3]

Smart sensors, methods of internal compensation, information coding, integrated sensor principles, present trends. [4]

#### **Book:**

1. Triethy HL - Transducers in Electronic and Mechanical Design, Marcel Dekker 1986
2. D. Patranabis – Sensor and Transducers (2e) Prentice Hall, New Delhi, 2003
3. Silicon Sensors – Middlehoek S and Audel S. A. – Academic Press, London 1989
4. Chemical Sensors – Edmonds T. E. (Ed); Blackie – London, 1988
5. Problems and possibilities of oxidic and organic semiconductor gas sensors, G. Heiland and D. Kohl, Sensors and Actuators, Volume 8, Issue 3, November 1985, Pages 227-233.
6. Thick-film sensors: an overview, Maria Prudenziati and Bruno Morten, Sensors and Actuators, Volume 10, Issues 1–2, 10 September 1986, Pages 65-82.
7. The use of polymer materials as sensitive elements in physical and chemical sensors, F.J. Gutierrez Monreal, Claudio M. Mari,

**(All periods will be of at least 50 minutes duration)**