Department Elective without Laboratory

Nirma University
School of Technology, Institute of Technology
B. Tech (Electronics and Instrumentation Engineering)
Department Elective

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Course Code	**2EIDE01**
Course Title	**Advanced Sensors**

Course Learning Outcome:

At the end of the course, students will be able to –

- explain principle, construction and applications of advanced sensors
- analyze and select appropriate sensors for different applications
- apply appropriate sensors and instrumentation for emerging applications

Syllabus	**Teaching Hours**
UNIT 1: Introduction Recap of fundamentals of transducers and measurement and motivation – basic and advanced sensors, transducers and instrumentation	**03**
UNIT 2: Advanced sensors and transducers Working principles, construction, signal conditioning and measurement techniques for MEMS (Micro Electro Mechanical) sensors, fiber-optic sensors, nano-sensors, magnetic field, microwave and radiation sensors, vision and imaging sensors, comparisons and selection.	**08**
UNIT 3: Analytical measurements Sensors, measurement techniques and instruments for various measurements such as humidity, moisture, density, conductivity, ORP (oxygen reduction potential), pH, polarography, viscosity, consistency, turbidity, opacity	**11**

UNIT 4: Analytical instrumentation

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Industrial gas analysis, chromatography, mass spectrometer, IR (infrared) analyzers, spectrophotometry – atomic, visible, UV (ultraviolet), NMR (Nuclear Magnetic Resonance), ESR (Electron Spin Resonance), comparative analysis and selection.

UNIT 5: Emerging Sensing and Instrumentation Applications

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Sensors, measurement techniques and instruments for emerging application areas such as environmental measurement like DO (dissolved oxygen), BOD (biological oxygen demand), COD (chemical oxygen demand), TOC (Total Organic Carbon), COx (carbon oxides), NOx (nitrogen oxides), SOx (sulphur oxides); for navigation and inertial measurements, for RF (radio frequency) measurements, for Agricultural measurements such as Soil-moisture, wind-speed, solar irradiation, leaf-wetness duration, leaf-area; sensors for food-processing like smell or odour, taste.

Self Study:

The self study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

References:

1. K. Ghosh, Introduction to Measurements and Instrumentation, PHI Publication.
2. Krishnakumar, Sensors and instruments in Agriculture: Microprocessor based Instrumentation for Agriculture industry, PHI Publication
3. Eric Udd, Fiber Optics Sensors, Wiley Publishers
4. R. S. Khandpur, Handbook of Analytical Instruments, Tata-McGraw-Hill Education.
5. K. Sawhney, A Course in Mechanical Measurements and Instrumentation, Dhanpat Rai Publication.