INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

NANO TECHNOLOGY								
VIII Semester: ECE								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
AECD68	**Open Elective**	3	-	-	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Prerequisite: There are no prerequisites to take this course								

I. COURSE OVERVIEW:
The course will discuss interesting interdisciplinary scientific and engineering knowledge at the nanoscale to understand fundamental physical differences at the Nano sensors, students will understand the fabrication, characterization, and manipulation of nanomaterials, Nano sensors, and how they can be exploited for new applications. Also, students will apply their knowledge of nanotechnology and Nano sensors to a topic of personal interest in this course

II. COURSES OBJECTIVES:
The students will try to learn

I. Understand the basic principles of nanoscale materials and its fabrication.
II. Classify the different types of nano sensors
III. Known the quantum dot sensors in nano technology

III. COURSE OUTCOMES:
At the end of the course students should be able to:

CO 1 Understand the basic principles of nano structures to define the dimensions of different nanostructures
CO 2 Interpret the fabrication top-down structure for nano scale structures
CO 3 Classify different types of parameters for sensors characterization.
CO 4 Make use of properties of nanoparticles for detection of DNA and Biomolecules.
CO 5 Describe the importance of nanoparticle-based sensors for medical and biological Applications.
CO 6 Demonstrate the basic concepts of Quantum Dots for quantum dot sensor application

IV. COURSE CONTENT:

MODULE - I: INTRODUCTION TO NANOTECHNOLOGY (09)
Introduction and overview of Nanotechnology, Definitions and nanomaterials, Nanostructures 0-D,1-D,2-D and 3-D.

MODULE –II: INTRODUCTION TO NANOTECHNOLOGY (08)
Characterization tools for nanotechnology, Fabrication in the nano-scale-top down Fabrication, Fabrication of Nano-scale structures and devices-Bottom up Fabrication.

MODULE –III: INTRODUCTION TO SENSORS SCIENCE AND TECHNOLOGY (10)
Human senses & components and classification of sensors, Parameters for sensors characterization & introduction to sensors array. Static Characteristics: Accuracy, precision, resolution, sensitivity, linearity, range, drift, hysteresis.

Dynamic Characteristics: Response time, rise time, settling time, bandwidth, frequency response. Reliability and Repeatability: Mean time between failures (MTBF), environmental effects. Calibration Methods: Need for calibration, methods and standards, zero and span calibration.

MODULE –IV: METAL NANOPARTICLES- BASED SENSORS (09)
Introduction to basic properties of Nanoparticles & synthesis of Nanoparticles, Sensors based on Nanoparticles for detection of DNA and Biomolecules & chemi-resistors based on Nanoparticles, Medical and biological Applications of gold Nanoparticles

MODULE –V: QUANTUM DOT SENSORS (09)
Definitions and properties of quantum Dots, Synthesis of Quantum dots &Sensing and imaging Application with Quantum Dots.

V. TEXT BOOKS:

1. Kourosh Kalantar, Zadeh, Benjamin Fry, “Nanotechnology- Enabled Sensors”, Springer.
2. H.Rosemary Taylor, “Data acquisition for Sensor Systems”, Chapman & Hall, 1997

VI. REFERENCE BOOKS:

1. R. Walt, Charles L. Wilkins, “Biosensing: International Research and Development”, Springer,
2. Ramon Pallas-Areny, John G. Webster, “Sensors and signal conditioning” John Wiley & Sons, 2001.

VII. ELECTRONICS RESOURCES:

1. NPTEL :: Introduction to nanotechnology
2. NPTEL :: NOC: Nanotechnology, Science and Applications
3. NPTEL :: Nanotechnology, Science and Applications
4. https://onlinecourses.nptel.ac.in/noc19_bt28/preview

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open end experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper - II
9. Lecture notes
10. E-learning readiness videos (ELRV)
11. Power point presentation