AMITY UNIVERSITY
UTTAR PRADESH

FORMAT FOR COURSE CURRICULUM

Course Title: Physical and Chemical Sensing Devices

LEVEL: PG
Course Code: **Credit Units: 3**

L	T	P/S	SW/FW	TOTAL CREDIT UNITS
3	0	0	0	3

Course Contents/Syllabus:

	Weightage (%)
Course Objectives: This course is intended to know sensor and actuators characteristics, principle of operation and different types of micro and nano- sensor and also of Micro and Nano-actuators.	
Pre-requisites: The student should have knowledge of basic knowledge of material properties	
Student Learning Outcomes: **Student will be able to:** 1. Identify the physics behind sensor and actuator transduction. 2. Interpret the rotational, acceleration, force, torque, pressure, flow sensor, temperature, proximity, light, smart material, capacitive and inductive sensors in micro and nano dimensions. 3. Perceive actuator operation and its characteristics such resolution, range, sensitivity, error, repeatability, linearity, accuracy and impedance etc.,	

Module I : Sensors and Nanotechnology enabled sensors	**20 %**
Descriptors/Topics Introduction, Physics of Scaling – General Mechanisms for Electromechanical transduction – Sensor and Actuator Transduction Characteristics, Sensors: Physical Sensors, Chemical Sensors, Possibilities, Realities and applications	
Module II **Introduction to Sensors**	**30%**
Descriptors/Topics Sensors – Classification, Principle of operation – Linear and rotational sensors, Acceleration sensors, Force, torque and pressure sensors, Flow sensors, Temperature sensors, Proximity sensors, Light sensors, Smart material sensors, Micro and nano-sensors.	
Module III **Introduction to Actuators**	**25%**
Descriptors/Topics Classification – Principle of operation – Electrical, Electromechanical, Electromagnetic, Hydraulic and pneumatic and smart material Actuators, Micro and Nano-actuators, Selection criteria	
Module IV **Sensor and Actuator Characteristics**	**25%**
Descriptors/Topics I Range, Resolution, Sensitivity, Error, Repeatability, Linearity and Accuracy, Impedance, Nonlinearities, Static and Coulomb Friction,	

Pedagogy for Course Delivery: Course delivery will involve power point presentations and explanation on board as required.

Lab/ Practicals details, if applicable: NIL

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	End Term Examination
100%		100%

Theory Assessment (L&T):

Continuous Assessment/Internal Assessment					End Term Examination
Components (Drop down)	**Home Assignment**	**Class Test**	**Seminar/ Quiz/ Viva**	**Attendance**	**Theory**
Weightage (%)	5	15	5	5	70

Lab/ Practical/ Studio Assessment: NIL

	Continuous Assessment/Internal Assessment				**End Term Examination**		
Components (Drop down							
Weightage (%)							

Text & References:

Text books:

1. Mechatronics – An introduction by Robert H Bishop, Taylor & Francis
2. Sensor Technology Handbook edited by Jon Wilson – Elsevier & Newness
3. Nanotechnology – Basic Science and Emerging Technologies, Michael Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse, Chapman & Hall CRC
4. Nanotechnology – A gentle Introduction to the next big idea by Mark Ratner and Daniel Ratner
5. Nano the essentials – Understanding Nanoscience and Technology by T Pradeep

References:

1. Introduction to Nanotechnology – Charles P Poole Jr, Frank J Owens, Wiley Interscience – John Wiley & sons
2. Nanotechnology for Dummies – Richard Booker, Earl Boysen, Wiley Publishing Inc.
3. Nanotechnology demystified by Linda Williams, Dr Wade Adams, Tata Mc Grawhill
4. Bionanotechnology by David Goodsell
5. Biosensing using nanomaterials edited by Arben Mercoci, Wiley Publishing Inc.
6. Engines of Creation by K Eric Drexler