

Lesson Plan

Subject : **Instrumentation and control (MEC-208A)**
Lesson plan Duration : 15 Weeks
Work load (lecture) per week : Lectures: 3 hours/Week

Lecture No	Description
1	Introduction to subject
2	UNIT:I Typical applications of instrument systems.
3	Functional elements of a measurement system, classification of instruments, standards and calibration.
4	Static and dynamic characteristics of measurement systems.
5	Statistical Error Analysis: statistical analysis of data and measurement of uncertainty: probability, confidence interval or level.
6	Mean value and standard deviation calculation.
7	Numerical problems
8	Standard normal distribution curve and probability tables, sampling and theory based on samples.
9	Goodness of fit, curve fitting of experimental data.
10	Numerical Problems
11	UNIT:II Sensors and Transducers: introduction and classifications.
12	Transducer selection and specifications, primary sensing elements.
13	Resistance transducers, variable inductance type transducers. capacitive transducers.
14	Piezo-electric transducers, strain gauges.
15	Smart Sensors: Introduction, architecture of smart sensor, bio sensor and physical sensor.
16	Piezo-resistive pressure sensor, microelectronic sensor.
17	Measurement of force, torque, shaft power, speed and acceleration: force and weight measurement system.
18	Measurement of torque, shaft power.
19	Speed and velocity: electrical and contactless tachometers.

20	Acceleration: vibrometers, seismic and piezo-electric accelerometer.
21	UNIT:III Measurement of pressure, temperature and flow: Basic terms, Pressure: Liquid column manometers, elastic type pressure gauges.
22	Electrical types for pressure and vacuum, temperature measuring instruments: RTD sensors.
23	NTC thermistor, thermocouples, and semiconductor based sensors.
24	Flow Measurement: drag force flow meter, turbine flow meter, electronic flow meter.
25	Electromagnetic flow meter, hot-wire anemometer.
26	Instruments for measuring Humidity, Density, and Viscosity: Humidity definitions, Humidity measuring devices.
27	Density and Specific Gravity, Basic terms, Density measuring devices.
28	Density application considerations, Viscosity, Viscosity measuring instruments.
29	Basic terms used in pH, pH measuring devices, pH application considerations.
30	Problems.
31	Unit IV Basic Control System: Introduction, basic components of control system.
32	Classification: closed loop and open loop control system, transfer function.
33	Block diagram representation of closed loop system .
34	Block diagram representation of closed loop system and its reduction techniques.
35	Mathematical modeling of various mechanical systems and their analogy with electrical systems.
36	Signal flow graph and its representation.
37	Mechanical Controllers: Basics of actuators: pneumatic controller.
38	Hydraulic controller and their comparison.
39.	Revision of controllers.
40.	Numerical problems on First unit.