MANIPAL UNIVERSITY JAIPUR

School of Electrical, Electronics & Communication Engineering (SEEC)

Department of Electronics & Communication Engineering
Course Hand-out

Transducers and Instrumentation| EC 1491 | 4 Credits

Session: July 14 – Dec. 14 | Faculty: Mr. Ashish Vijay | Class: Core Course

Course Outcomes: At the end of the course, students will be able to

[EC1491.1] Students will able to get the basic idea of measurements and the error associated with measurement.

[EC1491.2] Students will able to understand basics of transducers and different instruments .

[EC1491.3] To enable the students to select and design different bridges according to given specification

[EC1491.4] Analyse the behavioural characteristics of Instruments and transducers which improves research skills of students and provide employability in the area of Control and Instrumentation

A. SYLLABUS

Introduction: Units and systems, Dimensions and standards, Calibration methods, Static calibration, Generalized Measurement System, Sensor, Basic requirements of a transducer, Classifications of transducer. Error analysis, Statistical methods, Choice of transducer, factor influencing choice of transducer; Characteristics of a Transducer: Static characteristics, Accuracy, Precision, Sensitivity, Linearity, Hysteresis, Threshold, Resolution, Dead time, Dead zone, Scale range, Scale span - Dynamic characteristics - Speed of response, Measuring lag, Fidelity, Dynamic error- mathematical model of transducer - Zero, I, II order transducer, Response to step, ramp, impulse inputs; Instruments: Ammeter, Voltmeter. Expression for torque of moving coil, moving iron, dynamometer, induction and electrostatic instruments. Extension of range of instruments wattmeter, Torque expression for dynamometer instruments. Reactive power measurement; Bridge Methods: Measurement of inductance, capacitance and resistance using Bridge. Maxwell's Anderson, Wein bridge, Heaveside Cambell's Desauty's, Schering's bridges, kelvin's doublebridge, price guard wire bridge loss of charge method, Megger, Wagners Earthing device; Transducers : Principle of operation, construction, Characteristics and applications of potentiometer - loading effects, Strain gauge - theory, temperature compensation, applications – RTD , Thermistors, Hotwire anemometer, piezo resistive sensor; Inductive and capacitive transducer- Self-inductance, Mutual inductance transducer , Induction potentiometer, LVDT, RVDT, Synchro's, Capacitive transducer analog and digital transducer, Thermoelectric transducer, Photovolatic cell, Hall effect Piezo electric, Magnetostrictive

B. TEXT BOOKS

1 E.A. Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill, New York, 1990.

2 A.K. Sawhney, "A course in Electrical & Electronic Measurement and Instrumentation", Dhanpat Rai and Co (P) Ltd., 2011,

3 H.S. Kalsi, "Electronic Instrumentation", Tata McGrwaw-Hill, 2015