



# MECHANICAL MEASUREMENT SYSTEM

**PROF. RAVI KUMAR**

Department of Mechanical Engineering  
IIT Roorkee

**TYPE OF COURSE** : Rerun | Core | UG | PG  
**COURSE DURATION** : 8 weeks (20 Jul' 20 - 11 Sep' 20)  
**EXAM DATE** : 27 Sep 2020

**PRE-REQUISITES** : Nil

**INTENDED AUDIENCE** : Mechanical Engineering and Professionals

**INDUSTRIES APPLICABLE TO** : All Mechanical Engineering industries involving instrumentation

**COURSE OUTLINE :**

This Course provides a simple understanding of the mechanical measurement systems and statistical analysis of experimental data. The course contains the generalized configuration and functional elements of measuring systems, static and dynamic characteristics of measuring instruments. The course also include the instrumentation for displacement, strain, velocity, force, toque, power, pressure, sound, flow and temperature measurement.

**ABOUT INSTRUCTOR :**

Prof. Ravi Kumar is a Professor in the Department of Mechanical & Industrial Engineering, Indian Institute of Technology Roorkee. He has been teaching thermal engineering courses in the Department in addition to the course on Instrumentation and Experimental Methods. He is a member of ASME, ASHRAE and IIFIIR.

**COURSE PLAN :**

**Week-1** Basic concepts of measurement, functional elements of instruments, classification of measuring instruments, methods of correction for interfering and modifying inputs, static characteristics of measuring instruments

**Week-2** Static characteristics of measuring instruments, loading effect and impedance matching, statistical analysis, Chi-square test, least square method

**Week-3** Uncertainty analysis, problem solving, generalized model of a measuring system, zero and first order system, first order system- step response

**Week-4** First order system- ramp response, first order system- impulse response, first order system- frequency response, second order system- step response

**Week-5** Second order system- ramp response, second order system- impulse and frequency response, higher order systems, compensation, transducers

**Week-6** Transducers, flow measurement, temperature measurement

**Week-7** Strain gauges, piezoelectric transducers pressure measurement, force and torque measurement, displacement and acceleration measurement

**Week-8** Sound measurement, thermophysical properties measurement, flow visualization, air pollution sampling and measurement, problem solving