MME308 (L) : Metrology, Instrumentation and Control Lab.

Programme: B. Tech	Year: II	Semester: Fourth
Course: Core	Credits: 1	Hours: 20

Laboratory Overview and Context:

The objective of the course is to expose students to basics of manufacturing as it plays a direct role in improvement of quality of human life and creating wealth for the nation. The second objective of the course is to expose students to hands-on practice with common manufacturing processes. It will cover: (i) Importance of manufacturing, (ii) Relation between materials and manufacturing, (iii) An overview of manufacturing processes, (iv) Product manufacturing.

Prerequisite Courses: Fundamental of Physics, Chemistry and Mathematics.

Text Books:

[1] R K Jain, *Engineering Metrology*, Pearson Education India, 2009.
[2] R.K.Rajput, *Mechanical Measurement and Instrumentation*, S K KATARIA and SONS, 2015.
[3] B. C. Nakra, K. K. Chaudhry, *Instrumentation, Measurement And Analysis*, Tata McGraw-Hill Education, 2006.

Reference books:

[1] Thomas G. Beckwith, *Mechanical Measurements*, Addison-Wesley, 1993
[2] Alan S Morris, Reza Langari, *Measurement and Instrumentation: Theory and Application, Elsevier*, 2012.
[3] William Bolton, *Control Systems*, Oxford, 2002.
[4] Sergey E. Lyshevski, *Control Systems Theory with Engineering Applications*, Springer, 2014.

Additional Resources: NPTEL, MIT Video Lectures, Web resources etc.

Course Outcomes (COs): On completion of this course, the students will have:

CO1	Acquire importance to metrology in engineering.	Exp 1-3
CO2	Evaluate and understand the measuring instrument capabilities and ensure that these are adequate for their respective measurements.	Exp. 8
CO3	Understand the methodology, maintenance and the accuracies of measurement by periodical calibration of the metrological instruments	Exp 1-10
CO4	Acquire fundamentals of various metrological instruments and their working principles.	Exp 1-10
CO5	Understand, analyze and design the control systems for specific applications.	Exp 11-13

Sr. No.	List of Experiments	Student development
1	Introduction to Metrology and measurement instruments	Skill Development and Entrepreneurship
2	Measurements of linear / angular dimensions of a part using precision/non-precision measuring instruments.	Skill Development and Entrepreneurship

3	Precision angular measurement using sine bar/sine center.	Skill Development and Entrepreneurship
4	Measurement of temperature and pressure using various gauges.	Skill Development and Entrepreneurship
5	Measurement of screw thread using floating carriage micrometer. Measurement of gear tooth thickness by gear tooth vernier caliper	Skill Development and Entrepreneurship
6	Study of vibration & shock measuring set up.	Skill Development and Entrepreneurship
7	Measurement of screw thread using floating carriage micrometer.	Skill Development and Entrepreneurship
8	Calibration of dial gauges.	Skill Development and Entrepreneurship
9	Study and applications of profile projector and Tool Makers microscope.	Skill Development and Entrepreneurship
10	Study and applications coordinate measuring machine.	Skill Development and Entrepreneurship
11	Study of open loop control and closed loop control systems with MATLAB. Analysis of First order and second order systems with MATLAB.	Skill Development and Entrepreneurship
12	Study and design of proportional-integral-derivative control for system application using MATLAB.	Skill Development and Entrepreneurship
13	Air Track Experimental Setup.	Skill Development and Entrepreneurship

Evaluation Methods:

Item	**Weightage (%)**
Attendance	10
Lab Report	40
Final Lab exam including viva	50

Prepared By:
Last Update: 8th November, 2016.