

McEng 3176 – Instrumentation Lab Exercise

Course Number: McEng 3176	Credit Hours: 2
Course Title: Instrumentation Lab Exercise	Contact Hours: 6 Laboratory hrs
Course Objectives: This course is arranged to: <ul style="list-style-type: none">• To reinforce the concepts studied in the instrumentation and control subject for the practical/real world applications.• To understand the concept of controlling the parameters based on measurement.• Illustrate the logical method of approach to experimental work,• Give the student experience in obtaining and recording data, making computations, analyzing and interpreting results, and• Train the student on writing concise reports wherein he presents, summarizes, analyzes, and interprets the findings in manner consistent with engineering practice.	
Course Description: Study of the working and implementing of the systems covering the following listed below: <ol style="list-style-type: none">1. Investigate the characteristics of resistance thermometer, thermocouple, radiation pyrometer.2. Analyze the characteristics of speed measurement using tachometer, stroboscope.3. Investigate the characteristics of piezo electric sensor.4. Acquire the knowledge of torque measuring devices. Analyze the characteristics of LVDT.5. Acquire measuring techniques of angular measurements using tachogenerator.6. Obtain knowledge on speed measurement using PID controller.7. Design and development of digital to analog converter and analog to digital converter.	
Course Outline:	

A laboratory exercise will be given after providing a discussion on the theory behind the characteristics of a system to be studied.	
Pre-requisites: McEng 3171 – Instrumentation and Measurement	
Co-requisite: McEng 3172 - Introduction to Mechatronics Systems	
Textbook: 1. J.P.Bently, Principles of Measurement Systems, Longman Inc., 1983.	
References: 1. R.H.Warring, Pumping Manual, Gulf Publishing Co., 1984.	
Teaching Methods: <ul style="list-style-type: none"> • Discussion and project exercises with individual advising. 	
Lab. Exercises: 1. TEMPERATURE MEASUREMENT AND CONTROL Temperature measuring devices like platinum resistance thermometer, thermocouple, radiation pyrometer etc. 2. SPEED MEASUREMENT AND CONTROL Studying the devices and characters and measuring the speed using tachometer, stroboscope etc. 3. FORCE MEASUREMENT Force measuring devices, load cells and proving rings. 4. PRESSURE MEASUREMENT Pressure measuring device, piezo electric sensor. 5. TORQUE MEASUREMENT. Torque measurement – using torque measuring devices. 6. STRAIN MEASUREMENT. Study and use of strain – strain gauge indicator.	7. POSITION MEASUREMENT USING LINEAR SCALE Position measurement, LVDT. 8. DISPLACEMENT MEASUREMENT LVDT- Displacement and velocity measurement using encoders 9. ANGULAR VELOCITY MEASUREMENT USING ENCODERS Measure the angular velocity of the PMDC motor using encoder. 10. SPEED MEASUREMENT USING TACHOGENERATOR Measure the speed of DC motor using tachogenerator then plot speed Vs voltage characteristics. 11. SPEED MEASUREMENT AND CONTROL USING PID CONTROLLER Study the action of PID controller using a speed control system. 12. DIGITAL TO ANALOG CONVERTER Digital converter using op-amp. 13. ANALOG TO DIGITAL CONVERTER Analog converter using op-amp.

Attendance Requirement:

- Minimum of 75% attendance during lecture hours; and
- 100% attendance during project work sessions, except for some unprecedented mishaps.

Evaluation:

- Each Laboratory Exercise 10%.