Fall 2019

ME 343-101: Mechanical Laboratory I

Trivikrama Pala

ME 343-003 Mechanical Laboratory I
Fall 2019; ME 214 Lab

Instructor: Prof. Trivikrama Pala; 1-862-221-0860; e-mail: trivikrama.b.pala@njit.edu

Teaching Assistant: Jiawei Li; (1-862-371-9099; ME 333J); e-mail: jl599@njit.edu
Office hours: 5: 00 to 5:45 PM Tuesday ME214 Lab

Textbook: J. P. Holman, Experimental Methods for Engineers, 8th Edition, McGraw Hill, 2011

Course Content

Topic	Reading Assignment	Key concepts
Introduction; Data analysis	2.7, 3.2-3.9, 3.11-3.14, Notes 1, 4	Random and precision errors; Least square method; Uncertainty analysis
Linear and Rotation Speed Measurements	Note 3	Cross-correlation theory; Oscilloscope applications Lab abstract writing
Signal Conditioning	4.12, 14.3	RC filtration; Power spectrum; Digital filtration
Temperature measurements	8.5,8.6, 8.8, 8.9, 2.7 Notes 3; 5	Thermocouple; thermo-resistance; pyrometers Full lab report writing
Force and Torque Measurements (Strain gage)	10.3-10.8 Notes 6-7; supplements	Strain-stress relationship; strain gage; Wheatstone bridge; Force and deformation of elastic collisions
Programmable Logic Control	Note 9; supplements	PLC, Ladder logic diagram
P.I.D	Class notes	
Flowrate & Velocity Measurements	7.3, 7.4, 7.6, 7.13 Note 8; supplements	Venturi, orifice & rotameter; Pitot tube, LDV and PIV; Flow visualization
Acoustics	11.5; Note 10	Sound pressure level (dB); Attenuation

Course Arrangement

Week	Lecture/Lab: Tuesday: 5:45 p.m. – 9:35 p.m. in MEC 214			
	Topic	HW/Lab	Topic	**Due (Tuesday class)**
1	Introduction; Chap 3 Random data statistics; regression method	HW#1	Random error, least square regression	-
2	Linear and rotation speed measurements; Lab abstract requirement of rotation speed	Lab-1	Rotation speed;	HW#1
3	HW#1 Solution Uncertainty analysis; Chap 3	HW#2	RC Filtration	Rotation
4	Signal Conditioning by RC Filter and Characteristics Analysis	Lab-2		HW#2
5	HW#2 Solution Thermometry: Chap 8, Chap 2	HW#3	Temperature	RC Filtration
6	Measurement of Temperature and Characteristics of Sensor	Lab-3	Temperature	HW#3
7	**Mid-term**		**Mid-term**	
8	Mid-term solution Stress & strain; strain gage: Chap 10	HW#4	Strain gage & Dynamic force	Temperature
9	**Spring Break**			
10	Measurement of Mechanical Stress using Boned Strain Gages	Lab-4		HW#4
11	Flow rate: Chap 7 Measurement of Visualization of Flow	Lab-5	-	Strain gage & dynamic force
12	Control Theory (PLC) Understanding of PLC Controllers and Applications	Lab-6	PLC /Flowrate	Flowrate
13	Understanding of PID Controllers and Applications	Lab-7	Flow	PLC Controllers
14	Acoustics: Chap 11; Measurement of Acoustic Response	Lab-8		PID Controllers
15	Review	Backup	-	Acoustics All resubmissions
16	Final Exam			

Tentative Schedule of ME 343 Spring 2019 Semester

Week	Tuesday	Due
1	9/03 Lecture	
2	9/10 (lab-1)	HW-1
3	9/17 Lecture	Lab-1
4	9/24 (lab-2)	HW-2
5	10/01 Lecture	Lab-2
6	10/08(lab-3)	HW-3
7	10/15(Mid Term)	-
8	10/22 Lecture	Lab-3
9	10/29 (Spring Break)	-
10	11/05 (lab-4)	HW-4
11	11/12(lab-5)	Lab-4
12	11/19(lab-6)	Lab-6
13	11/26(lab-7)	Lab-6
14	12/03 (lab-8)	Lab-7
15	12/10 (backup)	Lab-8 & all re-sub
16	12/17	