ME 343 Mechanical Laboratory I

Instructor: Dr. P. Singh

Online Office Hours: by appointment Office: 316 MEC Phone: 973-596-3326 Email: <u>singhp@njit.edu</u>

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

Course content						
Topic	Reading Assignment	Key concepts				
Introduction;	15.4; 2.7, 3.3, 3.4, 3.6, 3.8,	Lab report writing; linear aggression; Uncertainty				
Data analysis	3.9, 3.11-3.14, Notes 1-3	analysis				
Speed Measurements and	4.12, 4.15	Filtration theory; Oscilloscope applications				
Signal Filtration	Notes 4-5					
Temperature measurements	8.5,8.6, 8.8, 8.9, 2.7	Thermocouple; thermo-resistance; pyrometers				
	Notes 6-7					
Force and Torque	10.3-10.8	Strain-stress relationship; strain gage; Wheatstone				
Measurements (Strain gage)	Notes 8-9	bridge				
Flow rate & Velocity	7.3, 7.4, 7.6, 7.13	Bernoulli equation; Venturi meter; Pitot tube; Laser				
Measurements	Note 10; supplements	Doppler Velocimetry; Flow visualization				
Control (PLC & PID)	Note 12; supplements	PLC, Ladder logic diagram; PID				
Acoustics	11.5; Note 11	Sound pressure level (dB); attenuation				

Course Content

Course Arrangement

Week					
	Topic	Homework	Topic	Report Due	
1	Introduction: Chap 15, Chap 3	-	-	-	
2	Data analysis Chap 3, Chap 4	HW#1	Rotation speed & signal filtration	-	
3	Sample analysis	-		HW#1	
4	Thermometry: Chap 8, Chap 2	HW#2	Temperature	Rot. Sp. & Fil.	
5	Sample analysis of Temperature	-		HW#2	
6	Strain gage: Chap 10	-	Strain 1; Mid-term	Temperature	
7	Strain gage (continue)	HW#3	Strain 2	-	
8	Sample analysis of Strain Gage	-	Strain 2	HW#3	
9	Pressure and flow: Chap 7	HW#4	Flow	Strain gage	
10	Sample analysis of Flow	analysis of Flow -		HW#4	
11	Acoustics: Chap 11	-	Acoustics	Flow	
12	Control Theory (PLC; PID)	HW#5	PLC Control	Acoustics (abstract)	
13	Sample analysis		PID Control	HW#5, PLC (Abstract)	
14	Review	-	-	PID (Abstract)	
	Final Exam				

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Course requirements and grading

(1) Grading:

50% Lab Report (5) and 5% Lab Abstract (1)
Lab attendance is required
5% Class Attendance (14)
10% Homework (5)
15% Midterm Examination
15% Final Examination

Final Grade: 90% and above "A" grade; and below 60% "F" grade.

(2) Lab Report Requirement

All reports should be completed individually and submitted on Canvas on time. Group discussions are encouraged, but you must write your own report.

(3) Homework and Lab Report Requirements

- (a) Five Assignments will be given, with 4-5 problems per assignment.
- (b) Assignments are due biweekly and must be submitted on canvas on time
- (c) Late submission will be accepted, but you will lose 50% points.
- (d) Homework grade will be based on the effort.
- (e) Homework will be returned in about one week.
- (4) Midterm/Final Exam Requirement
 - (a) Mid-term exam: It will cover the following topics: Uncertainty Analysis, Filtration Theory, and Theory for Temperature Measurement.
 - (b) Final exam: It will cover the following topics: Strain-gage Theory, Theory of Flow Measurement, PLC & PID Control Concept, and Theory of Acoustics Measurement.
 - (c) Examinations will be conducted online using canvas
 - (d) Both exams will be open book/notes