ME 343-101 Mechanical Laboratory I

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

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
Flowrate & Velocity Measurements	7.3, 7.4, 7.6, 7.13 Note 8; supplements	Venturi, orifice & rotameter; Pitot tube, LDV and PIV; Flow visualization
Programmable Logic Control	Note 9; supplements	PLC, Ladder logic diagram
Acoustics	11.5; Note 10	Sound pressure level (dB); Attenuation

Course Arrangement

Week	Lecture/Lab: Thursday: 6:30 p.m. – 10:00 p.m.			
	Topic	HW/Lab	Topic	**Due**
1&2	Introduction; Chap 3 Random data statistics; regression method	HW#1	Random error, least square regression; Rotation speed;	-
3	Linear and rotation speed measurements; Lab abstract requirement of rotation speed	Lab-1	Rotation speed;	HW#1
4	Uncertainty analysis; Chap 3	HW#2	RC Filtration	Rotation (Lab1)
5	Signal Conditioning by RC Filter and Characteristics Analysis	Lab-2		HW#2
6	Thermometry: Chap 8, Chap 2	HW#3	Temperature	RC Filtration (Lab 2)
7	Measurement of Temperature and Characteristics of Sensor	Lab-3		HW#3
8	**Mid-term**		**Mid-term**	
9	Stress & strain; strain gage: Chap 10 ;Mechanical Stress using Boned Strain Gages	HW#4	Strain gage & Dynamic force	
10	Stress & strain; strain gage: Chap 10 ;Mechanical Stress using Boned Strain Gages	Lab-4		Strain gage & dynamic force HW #4
11	Flow rate: Chap 7 ;Measurement of Visualization of Flow	HW#5	Flow	Strain gage & dynamic force Lab #4
12	Flow rate: Chap 7 ;Measurement of Visualization of Flow	Lab-5	Flow	Flow rate HW #4
13	Control Theory (PLC) Understanding of PLC Controllers and Applications	Lab-6 &HW#6	PLC	Flow rate (Lab -5)
14	Acoustics: Chap 11; Measurement of Acoustic Response	Lab-7 & HW #7	Acoustics	PLC Controllers (Lab 6) &HW6
15	No Class			
16	Backup Class	Backup		Acoustics (lab-7)
	Final Exam			

Tentative Schedule of ME 343

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Office hours: Thru email and prior appointment (5:00 to 6:00 PM on Thursday)

---------- Class Rules ----------

(1) Grade Calculations

45% Lab Report or Extended Abstract (2; 10% each) and Lab Abstracts (4; 5% each)
- Lab attendance is a must for each lab experiment! More than **30-min** delay is considered as absence. Absence leads to invalidation of lab reports.
- Makeup may be allowed, with TA's supervision, by paying 20US$/Hour to TA. only for cases of jury duties, illness and military services (with dean's approval).

10% Homework and attendance (6; 1.67% each)
20% Mid-term Examination (1)
25% Final Examination (1)
Some bonus points will be added in the Lab.

Final Grade is based on the total grade.
In general, above 90% guarantees an "A" grade and below 60% will result in an "F" grade.

(2) Lab Report/Abstract Requirement

All reports should be individually completed and submitted before due. Group discussion is encouraged but not for "Group Report". For identical reports or very similar reports, the grade is divided by the number of students involved (**such incidence will be reported to the department for record keeping**).
- Lab report must follow the formal report or abstract format (see lecture notes).
- Lab grade will be given based on the grading guideline of individual lab contents.

(3) Homework Requirements

(a) Assignments are due on **Tuesday** of the due week; with no late or resubmission.
(b) Homework grade is based on "completeness", not necessarily on "correctness".

(4) Late Submission and Resubmission of Reports

- Late or resubmission will be accepted, with a 50% grade deduction.
- The final grade will be the average with the original grade.
- Only one late or resubmission is allowed for each assignment.

(5) Mid-term/Final Exam Requirement

(a) A 1.5 hour mid-term exam will be given, mainly covering topics of Data Analysis and Theories for Speed, Signal Conditioning and Temperature Measurements.
(b) A 2.5-hour final exam will be given, mainly covering topics of Strain-gage Theory, Theory of Flow Measurement, PLC, Theory of Acoustics Measurement, and Signal Conditioning.

NOTE: All the above items may be subject to change as per instructor's discretion. (For example, the Grading Scale may be adjusted to reflect the class average.)

NJIT STUDENT HONOR CODE THIS WILL BE STRICTLY ENFORCED.