ME 343-101 Mechanical Laboratory I

Instructor: Prof. Trivikrama Pala; 1-862-221-0860; e-mail: trivikrama.b.pala@njit.edu Wednesday Class Teaching Assistant (TA) : Ketan Jawney; email: kj3<u>55@njit.edu</u>

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

Course Content

Торіс	Reading Assignment	Key concepts
Introduction;	2.7, 3.2-3.9, 3.11-3.14, Notes	Random and precision errors; Least square method;
Data analysis	1,4	Uncertainty analysis
Linear and Rotation Speed	Note 3	Cross-correlation theory; Oscilloscope applications
Measurements		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	Thermocouple; thermo-resistance; pyrometers
	Notes 3; 5	Full lab report writing
Force and Torque	10.3-10.8	Strain-stress relationship; strain gage; Wheatstone bridge;
Measurements (Strain gage)	Notes 6-7; supplements	Force and deformation of elastic collisions
Flowrate & Velocity	7.3, 7.4, 7.6, 7.13	Venturi, orifice & rotameter; Pitot tube, LDV and PIV; Flow
Measurements	Note 8; supplements	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: Wednesday: 6:30 p.m. – 10:00 p.m.				
	Торіс	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 ;Mechanica Stress using Boned Strain Gages	Lab-4 & HW#4	Strain gage & Dynamic force	Temperature (Lab 3)	
10	Flow rate: Chap 7 ;Measurement of Visualization of Flow	Lab-5 & HW#5	PLC	Strain gage & dynamic force (Lab-4) and HW #4	
11	Control Theory (PLC) Understanding of PLC Controllers and Applications	Lab-6 &HW#6	Flow	Flow rate (Lab -5) and HW #4	
12	No Class; Thursday Class meet	-	-	-	
13	Acoustics: Chap 11; Measurement of Acoustic Response	Lab-7	Acoustics	PLC Controllers (Lab 6) &HW6	
14	Revision	All Class revision		Acoustics (lab-7)	
15	Backup Class	Backup		All resubmissions	
16	Final Exam				

Tentative Schedule of ME 343

Week	Wednesday	Due
1&2	09/05 &12 - 1 st Lecture	
3	09/19 - lab 1	HW-1
4	09/26 - 2nd Lecture	Lab-1
5	10/03 - Lab 2	HW-2
6	10/10 3 rd Lecture	Lab-2
7	10/17 - (lab-3)	HW-3
8	10/24 - (Mid Term)	-
9	10/31st 4 th Lecture and Lab 4	Lab-3
10	11/07 5th Lecture and Lab 5	Lab 4 HW-4
11	11/14 6 th Lecture and Lab 6	Lab-5 and HW-5
12	11/21 No Class - Thrus Cl.Meet	-
13	11/28 - 7th Lecture and Lab 7	Lab -6 and HW 6
14	12/07 Revision	Lab7
15	12/12 Backup	All lab dues
16	12/19(Final Exam)	-

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Instructor: Prof. Trivikrama Pala; 1-862-221-0860; e-mail: <u>trivikrama.b.pala@njit.edu</u> 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 <u>30-min</u> delay is considered as absence. <u>Absence leads to invalidation of lab reports</u>.
- Makeup may be allowed, with TA's supervision, by paying 20US\$/Hour to TA. <u>only</u> 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% FinalExamination (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 (<u>such incidence will be reported to the department</u> 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.

<u>NOTE:</u> 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.

Prof.Trivikrama Pala