Mechanical and Industrial Engineering Syllabi

NJIT Syllabi

Fall 2019

ME 343-003: Mechanical Laboratory I

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ME 343-003 Mechanical Laboratory I (Fall 2019)

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Notes: https://web.njit.edu/~me/ME343_notes_Zhu/me343_cover_sheet.html; password: me343f09
Office hours: Mondays: 3:00 – 5:00 pm; Wednesdays: 1:00-2:30 pm

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
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
Signal Conditioning	4.12, 14.3	RC filtration; Power spectrum; Digital filtration

Course Arrangement

Week	Lecture/Lab: Wednesdays and Fridays: 9:15 a.m. – 11:20 a.m. in MEC 214			
	Topic	HW/Lab	Topic	Due (Wednesday noon)
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 (Wed)	Rotation speed;	HW#1
3	HW#1 Solution Thermometry: Chap 8, Chap 2 Uncertainty analysis; Chap 3	HW#2	Temperature	Rotation (abstract)
4	Signal response & sensitivity Lab report requirement of temperature	Lab-2 (Wed)		HW#2
5	HW#2 Solution Stress & strain; strain gage: Chap 10	HW#3	Strain gage & Dynamic force	Temperature (**full**)
6	Strain gage rosette & dynamic force	Lab-3 (Friday)		HW#3
7	HW#3 Solution, Abstract requirement of strain gage & force	-	**Mid-term (Friday)**	-
8	Mid-term solution Control Theory (PLC)	-		Strain gage & dynamic force (**extend abstract**)
9	Abstract requirement of PLC Flow rate: Chap 7	Lab-4 (Wed)	PLC /Flowrate	**-**
10	Flow velocity; visualization, frictional pressure loss; Abstract requirement of flowrate	HW#4	Flow	Control (abstract)
11	Acoustics: Chap 11	Lab-5 (Wed)		HW#4
12	HW#4 Solution Abstract requirement of Lab-6	HW#5 Lab-6 (Friday)	Acoustics	Flow (**extend abstract**)
13	Signal Conditioning	-	Signal Conditioning	HW#5
14	HW#5 Solution Review	-	-	Lab-6 abstract **All resubmissions (F)**
Final Exam				

Week	Wednesday	Friday	Due
1	9/4	9/6	-
2	9/11 (lab-1)	9/13	HW-1
3	9/18	9/20	Lab-1
4	9/25 (lab-2)	9/27	HW-2
5	10/2	10/4	Lab-2
6	10/9	10/11 (lab-3)	HW-3
7	10/16	10/18 (MT)	-
8	10/23	10/25	Lab-3
9	10/30 (lab-4)	11/1	-
10	11/6	11/8	Lab-4
11	11/13 (lab-5)	11/16	HW-4
12	11/20	11/22 (lab-6)	Lab-5
13(1)	11/27	-	HW-5
13(2)/14(1)	12/4	12/6 (review)	Lab-6 & all re-sub
14(2)	12/11 (backup)	-	-

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

(1)   Grade Calculations

45% Lab Report or Extended Abstract (3; 10% each) and Lab Abstracts (3; 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, only for cases of jury duties, illness and military services (with dean's approval).
15% Homework (5; 3% each)
15% Mid-term Examination (1)
25% Final Examination (1)

Some bonus points (less than 10%) are given to lab assignments and exams.

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 Wednesday noon of the due week; with no late or resubmission.
(b) Homework grade is based on "completeness", not necessarily on "correctness".
(c) Homework solutions will be explained in class, typically in the following week of due.

(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 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.

    (c) <u>All exams are open book and notes, with no computers or e-tools allowed.</u>