



Course Code-Name	ME 402 Experimental ME II		
Prerequisites	ES 222, ME 262, ME 351		
Course Schedule	Wed 13:00-14:00 (lecture), Mon 14:00-17:00 (lab, section 01), Wed 14:00-17:00 (lab, section 02)		
Course Web Page	http://me.yeditepe.edu.tr/courses/me402/me402.htm		
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Textbook	Figliola, R.S. and Beasley D.E., Theory and Design for Mechanical Measurements, 4 th ed., Wiley, 2006		
Course Outline	Wks.	Days	Lecture Planned
	1st	2-Feb	Introduction
	2nd	9-Feb	Static and Dynamic Characteristics of Signals (Ch.2): Input-Output Signal Concepts, Signal Analysis, Signal Amplitude and Frequency.
	3rd	16-Feb	
	4th	23-Feb	Measurement System Behavior (Ch.3)
	5th	2-Mar	
	6th	9-Mar	Uncertainty Analysis (Ch.5): Error Sources, Bias and Precision Errors, Error Propagation.
	7th	16-Mar	
		23-Mar	Spring Break
	8th	30-Mar	Analog electrical devices and measurements (Ch.6): Current measurements, Voltage measurements, Resistance measurements, Loading errors and impedance matching, amplifiers, analog signal conditioning.
	9th	6-Apr	
	10th	13-Apr	Sampling, digital devices, and data acquisition (Ch.7): Sampling rate, aliasing, D/A conversion, A/D conversion, DAQ systems.
	11th	20-Apr	
	12th	27-Apr	Strain measurement (Ch.11)
	13th	4-May	
Midterm Dates	TBA		
Grading	Lab reports 40%, Design of an experiment 20% Homeworks 10%, Midterm 10%, Final 20%		
Attendance	Minimum of 80% attendance required for admittance to final exams, due to university regulations.		
Policies	<ul style="list-style-type: none"> This course consists of a lecture hour and lab experiments. Lab attendance is mandatory. Students, who do not attend 80% of the labs or lectures, will not be admitted to the final exam and fail the class. Lab experiments will be done by groups of three or four students. During the first lecture you will be asked to form your lab groups. You must arrive at labs on time. You will be considered absent if you do not come to lab within the first 10 minutes. Eating, drinking, or smoking is not allowed in the laboratory. You are expected to read the lab handouts and be prepared before the experiments. Quizzes will be given in the beginning of lab sessions. Lab reports are due one week from each experiment. Late lab reports will not be accepted. Make-up exams will only be given to those students who have missed a midterm exam because of a valid and documented excuse. You will be asked to design and conduct an experiment, possibly with an interdisciplinary team of students. You will prepare a written report and give an oral presentation of that experiment in the last week of the semester. 		
Lab Report Format	<p>Lab reports will be evaluated based on their content and presentation. Your reports should include the following sections:</p> <ul style="list-style-type: none"> Title Page. Name, lab no, lab date Objective. A brief but clear explanation on the goals of the experiment should be given. Introduction Theory. The basic theory and concepts behind the experiment should be mentioned. Experimental Procedure. A description of the method used to gather data and a schematic and/or block diagram of the experimental set up should be provided. Data and Results. This section must include all data and results of the experiment regardless of the 		



degree of error. Any tabulated data and/or graphs with regard to the actual experiment should be presented. Include a discussion on the results noting trends in measured data, and comparing measurements with theoretical predictions when possible.

- **Sample Calculations.** Complete calculations for at least one set of data must be presented.
- **Discussion and Conclusions.** This section must include the physical interpretation of the results, the reasons on deviations of your findings from expected results, your recommendations on further experimentation for verifying your results, and your remarks.
- **References.** A list of sources and reference materials used must be given. Each item in this list should be properly referred to within the main body of the report.
- **Appendices.** If necessary, put additional information that takes up large amount of space in here.

Lab Program

	sec.01	▶	M1400	M1530	Lab #	M1400	M1530	Lab #
	▼	sec.02	W1400	W1530		W1400	W1530	
1st	2-Feb	4-Feb						
2nd	9-Feb	11-Feb	G1	G2	L1	G3	G4	L6
3rd	16-Feb	18-Feb	G4	G3	L1	G2	G1	L6
4th	23-Feb	25-Feb	Experiment Design, All Groups					
5th	2-Mar	4-Mar	G1	G2	L2	G3	G4	L7
6th	9-Mar	11-Mar	G4	G3	L2	G2	G1	L7
7th	16-Mar	18-Mar	Experiment Design, All Groups					
	23-Mar	25-Mar						
8th	30-Mar	1-Apr	G1	G2	L3	G3	G4	L4
9th	6-Apr	8-Apr	G4	G3	L3	G2	G1	L4
10th	13-Apr	15-Apr	Experiment Design, All Groups					
11th	20-Apr	22-Apr	G1	G2	L5	G3	G4	L9
12th	27-Apr	29-Apr	G4	G3	L8	G2	G1	L9
13th	4-May	6-May	G1	G2	L8	G3	G4	L5
14th	11-May	13-May	Experiment Demos					

Experiments		Assistant
L1	Tension test	E.A.T
L2	PID tuning of hydraulics control	B.Ö
L3	Three-point bending test	B.Ö
L4	Strain gauges	E.A.T
L5	Metallography	S.Z
L6	Free vibrations	S.Z
L7	Hardness test	S.Z
L8	Servo control of a linear axis	B.Ö
L9	Time constant of an RC circuit	E.A.T

Course Objectives

This is the second course in the series of experimental mechanical engineering I/II courses. Objectives are to provide the students with a hands-on experience in the area of solid mechanics and controls, while focusing on the fundamental concepts of measurement techniques.

Lectures are designed to provide the student with techniques used in measurement and experimentation, such as basic concepts of measurement systems, calibration, standards, presenting data, static and dynamic characteristics of signals, statistical analysis of experimental data, and uncertainty analysis.

This course aims at providing a team work environment to the students on conducting experiments. Also, it is also among of the objectives of this course to improve students' experimental data analysis, presentation and technical report writing skills.

Course Outcomes

Indicates the level of satisfaction of the course for the outcomes listed.

- ⊙: Not Applicable
- ①: Not Satisfactory
- ⑤: Highly Satisfactory

an ability to apply knowledge of mathematics, science and engineering	⊙	①	②	③	④	⑤
an ability to design and conduct experiments as well as to analyze and interpret data	⊙	①	②	③	④	⑤
an ability to design a system, component or process to meet desired needs	⊙	①	②	③	④	⑤
an ability to function on multi-disciplinary teams	⊙	①	②	③	④	⑤
an ability to identify, formulate, and solve engineering problems	⊙	①	②	③	④	⑤
an understanding of professional and ethical responsibility	⊙	①	②	③	④	⑤
an ability to communicate effectively	⊙	①	②	③	④	⑤
the broad education is necessary to understand the impact of engineering solutions in a global and societal context	⊙	①	②	③	④	⑤
a recognition of the need for, and an ability to engage in life-long learning	⊙	①	②	③	④	⑤
a knowledge of contemporary issues	⊙	①	②	③	④	⑤
an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	⊙	①	②	③	④	⑤