Solid Mechanics Laboratory

Course Code:

ME 266

Course Period:

Spring

Course Type:

Core

Credits:

2

Theoric:

1

Practice:

0

Laboratory Hour:

2

ECTS:

3

Prerequisite Courses:

Statics [1]
Malzemelerin Mukavemeti [2]
Course Language:

English

Courses given by:

Onur Cem Namlı [3]
Course Objectives:

This course serves the two major goals of observing mechanical properties of materials pertinent to mechanics of solids; and gaining hands-on practice and confidence as well as learning the limitations of computational solid mechanics methods.

Course Content:

Tensile and hardness tests, metallography. Principles behind strain gauges, wheatstone bridges. Practice with strain gauge instrumentation and implementation. Measurement of strain in axially, torsionally, and transversely loaded structural elements. ASTM standarts for various tests. Strain measurement in simple structures such as box beams. An overview of the Finite Element method and virtual experimentation via FE analysis software.

Prerequisite(s): ME 246 (co-requisite)

Course Methodology:

1: Lecture; 5: Laboratory

Course Evaluation Methods:

A: Midterm and final exams; B: Quiz; D: Report

Learning Outcomes	Program Outcomes	Teaching Methods	Assessment Methods
1) Observe and assess uncertainty in mechanical measurements and describe its causes.	5	1,5	A,D
2) Operate and collect data using standard and non-standard experimental apparatus and procedures.	4, 5	5	B,D
3) Interpret, organize and present the results of acquired data, and discuss the outcome of experiments.	6, 7	1,5	D
4) Employ computational techniques and tools necessary for simulating physical experiments, gain confidence with and explore boundaries of these tools.	4,13	5	B,D

COURSE CONTENT		
Week	**Topics**	**Study Materials**
1	Introduction to report writing	Handout
	An overview of analyzing mechanics of solids using the FEA	Lecture notes

3	The bending strength of pasta	Lab manual
4	Measurement and uncertainty	Lab manual
5	Modeling the tensile test conditions	Lab manual
6	Theory of tensile tests	Lab manual
7	Analyzing raw data from the tensile test	Lab manual
8	Metallurgical examination via optical microscopy	Lab manual
9	On the microstructure of metals	Lab manual
10	Theory of Hardness Testing	Lab manual
11	Data analysis and reduction ın hardness	Lab manual
12	Modeling the Rockwell test conditions	Lab manual
13	Theory of the three-point bending test	Lab manual
14	More about the three-point bending test	Lab manual

RECOMMENDED SOURCES	
Textbook	N/A
Additional Resources	.

MATERIAL SHARING	
Documents	Lecture notes, Lab Manuals
Assignments	Experimental Data
Exams	Final exam is not shown in the website

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
Quizzes	5	15
Lab Reports	5	85
Total		**100**
CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE		40
CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE		60

Total		**100**

COURSE'S CONTRIBUTION TO PROGRAM								
No	Program Learning Outcomes		Contribution					
		NA	1	2	3	4	5	
1	Adequate knowledge in mathematics, science and engineering subjects pertaining to the relevant discipline; ability to use theoretical and applied knowledge in these areas in complex engineering problems.	**X**						
2	Ability to identify, formulate, and solve complex engineering problems; ability to select and apply proper analysis and modeling methods for this purpose.	**X**						
3	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result; ability to apply modern design methods for this purpose.	**X**						
4	Ability to devise, select, and use modern techniques and tools needed for analyzing and solving complex problems encountered in engineering practice; ability to employ information technologies effectively.			**X**				
5	Ability to design and conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or discipline specific research questions.						**X**	
6	Ability to work efficiently in intra-disciplinary and multi-disciplinary teams; ability to work individually.				**X**			
7	Ability to communicate effectively in Turkish, both orally and in writing; knowledge of a minimum of one foreign language; ability to write effective reports and comprehend written reports, prepare design and production reports, make effective presentations, and give and receive clear and intelligible instructions.				**X**			
8	Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself.	**X**						
9	Consciousness to behave according to ethical principles and professional and ethical responsibility; knowledge on standards used in engineering practice.	**X**						

10	Knowledge about business life practices such as project management, risk management, and change management; awareness in entrepreneurship, innovation; knowledge about sustainable development.	**X**						
11	Knowledge about the global and social effects of engineering practices on health, environment, and safety, and contemporary issues of the century reflected into the field of engineering; awareness of the legal consequences of engineering solutions.	**X**						
12	Ability to work professionally in both thermal and mechanical systems areas, including design and realization.	**X**						
13	Ability to verify and validate numerical solutions to engineering problems.						**X**	

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION			
Activities	Quantity	Duration (Hour)	Total Workload (Hour)
Course Duration (Including the exam week: 16x Total course hours)	16	2	32
Hours for off-the-classroom study (Pre-study, practice)	16	1	16
Report writing	5	7	35
Final examination	1	4	4
Total Work Load			87
Total Work Load / 25 (h)			3.48
ECTS Credit of the Course			3