COURSE PROFILE

Course Name	Code	Semester	Term	Theory +PS+Lab. (hour/week)	Local Credits	ECTS
Mathematical Theory of Elasticity	MATH 352	Spring	6	3+0+0	3	5

Prerequisites	None

Course Language	English
Course Type	Elective
Course Lecturer	• Prof.Dr. Hilmi Demiray
Course Assistant	--
Course Objectives	The aim of the course is to present a mathematical model for the solid body and investigate the behavior of it under the effects of external forces.
Course Learning Outcomes	The students who succeeded in this course; • will be able to construct a mathematical modelling for engineering materials. • will be able to understand the physical characterization of various differential equations encountered in written literature. • will be able to solve some practical problems by use of the mathematics he(she) learnt throughout his(her) education.
Course Content	Mathematical preliminaries, kinematics and strain tensors, stress analysis. Linear constitutive relations, field equations of elastic bodies,Uniqueness theorem for elastostatics. Plane elasticity, plane strain and plane stress; compatibility conditions; airy stress function. The solution of some elasticity problems; elastic waves. Reflection and diffraction of elastic waves.

COURSE CONTENT

Week	Subjects	Related Preparation
1	Vectors and tensors; Summation convention; first order tensors, second order tensors; Symmetric and skew-symmetric tensors.	Chapter 1
2	Transformation of tensors; Invariant of tensors; Kronecker delta, permutation symbols, Dot and cross product of vectors; Divergence and rotation of	Chapter 1

	vectors; Divergence of second order tensors.	
3	Kinematics of continuous bodies: Spatial and material coordinates; Material time derivative; Velocity and acceleration vectors.	Chapter 2
4	Displacement vector; Infinitesimal strain tensors; Compatibility conditions.	Chapter 2
5	Stress: The concept of internal forces and stress vector; Surface traction; The concept of stress tensor.	Chapter 3
6	Properties of stress tensor; Normal and shear stresses; Solution of some problems.	Chapter 3
7	Balance equations of continuous bodies: Conservation of mass; Balance of linear and angular momenta.	Chapter 4
8	Stress quadratic of Cauchy; Principal directions and principal values of the stress. Conservation of energy. The concept of internal energy. **Midterm I**	Chapter 4
9	General theory of plane elasticity; plane deformation; Plane stress; Airy stress function.	Chapter 6
10	General theory of plane elasticity; plane deformation; Plane stress; Airy stress function.	Chapter 6
11	General plane elasticity solution (continued).	Chapter 6
12	Plane elasticity problems in Cartesian and polar coordinates.	Chapter 7, 8
13	Plane elasticity problems in curvilinear coordinates (continued)	Chapter 7, 8
14	Reflection and Diffraction of elastic waves. **Midterm II**	Chapter 8

Course Textbooks	Elasticity, Robert W. Little, Prentice Hall, 1972.
Recommended References	Any book on elasticity theory.

Semester Requirements	**Number**	**Percentage of Grade**
Attendance/Participation	-	-
Laboratory	-	-

Application	-	-
Special Course Internship (Work Placement)	-	-
Quizzes/Studio Critics	-	-
Homework Assignments	5	10
Presentation	-	-
Project	-	-
Seminar/Workshop	-	-
Midterms/Oral Exams	1	40
Final/Resit Exam	1	50
Total	7	100

PERCENTAGE OF SEMESTER WORK	6	50
PERCENTAGE OF FINAL WORK	1	50
Total	7	100

Course Category	Core Courses	X
	Major Area Courses	
	Supportive Courses	
	Media and Management Skills Courses	
	Transferable Skill Courses	

COURSE'S CONTRIBUTION TO PROGRAM

#	**Program Qualifications / Outcomes**	*** Level of Contribution**				
		1	2	3	4	5
1	To have a grasp of basic mathematics, applied mathematics and theories and applications of statistics.					X
2	To be able to use theoretical and applied knowledge acquired in the advanced fields of mathematics and statistics,					X
3	To be able to define and analyze problems and to find solutions based on scientific methods,					X

4	To be able to apply mathematics and statistics in real life with interdisciplinary approach and to discover their potentials,					X
5	To be able to acquire necessary information and to make modeling in any field that mathematics is used and to improve herself/himself,					X
6	To be able to criticize and renew her/his own models and solutions,					X
7	To be able to tell theoretical and technical information easily to both experts in detail and nonexperts in basic and comprehensible way,			X		
8	To be able to use international resources in English and in a second foreign language from the European Language Portfolio (at the level of B1) effectively and to keep knowledge up-to-date, to communicate comfortably with colleagues from Turkey and other countries, to follow periodic literature,				X	
9	To be familiar with computer programs used in the fields of mathematics and statistics and to be able to use at least one of them effectively at the European Computer Driving Licence Advanced Level,			X		
10	To be able to behave in accordance with social, scientific and ethical values in each step of the projects involved and to be able to introduce and apply projects in terms of civic engagement,			X		
11	To be able to evaluate all processes effectively and to have enough awareness about quality management by being conscious and having intellectual background in the universal sense,			X		
12	By having a way of abstract thinking, to be able to connect concrete events and to transfer solutions, to be able to design experiments, collect data, and analyze results by scientific methods and to interfere,				X	
13	To be able to continue lifelong learning by renewing the knowledge, the abilities and the compentencies which have been developed during the program, and being conscious about lifelong learning,					
14	To be able to adapt and transfer the knowledge gained in the areas of mathematics and statistics to the level of secondary school,			X		
15	To be able to conduct a research either as an individual or as a team member, and to be effective in each related step of the project, to take role in the decision process, to plan and manage the project by using time effectively.					

*1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION

Activities	**Number**	**Duration (Hours)**	**Total Workload**

Course Hours (Including Exams)	14	3	47
Tutorials	-	-	-
Laboratory	-	-	-
Application	-	-	-
Special Course Internship (Work Placement)	-	-	-
Field Work	-	-	-
Study Hours Out of Class	13	2	26
Presentations / Seminar	-	-	-
Project	-	-	-
Preparatory reading	13	1	13
Homework Assignments	5	3	15
Quizzes	-	-	-
Midterm Exams	1	8	8
Final / Resit Exam	1	16	16
		Total Workload	**125**

COURSE CATEGORY

ISCED GENERAL AREA CODES	GENERAL AREAS	ISCED BASİC AREA CODES	BASIC EDUCATIONAL AREAS	
1	Education	14	Teacher Training and Educational Sciences	0
2	Humanities and Art	21	Art	0
2	Humanities and Art	22	Humanities	0
3	Social Sciences, Management and Law	31	Social and Behavioral Sciences	0
3	Social Sciences, Management and Law	32	Journalism and Informatics	0
3	Social Sciences, Management and Law	38	Law	0
4	Science	42	Life Sciences	0

4	Science	44	Natural Sciences	0
4	Science	46	Mathematics and Statistics	70
4	Science	48	Computer	0
5	Engineering, Manufacturing and Civil	52	Engineering	30
5	Engineering, Manufacturing and Civil	54	Manufacturing and Processing	0
5	Engineering, Manufacturing and Civil	58	Architecture and Structure	0
6	Agriculture	62	Agriculture, Forestry, Livestock, Fishery	0
6	Agriculture	64	Veterinary	0
7	Medicine and Welfare	72	Medical	0
7	Medicine and Welfare	76	Social Services	0
8	Service	81	Personal Services	0
8	Service	84	Transport Services	0
8	Service	85	Environment Protection	0
8	Service	86	Security Services	0