OSTIM TECHNICAL UNIVERSITY
FACULTY OF ENGINEERING

COURSE SYLLABUS FORM
2021-2022

Instructors: Dr. Çağıl Merve Tanık, cagilmerve.tanik@ostimteknik.edu.tr
Assistance: Mehmet Can Türk mehmetcan.turk@ostimteknik.edu.tr

MEC 201 Statics

Course Name	Course Code	Period	Hours	Application	Laboratory	Credit	ECTS
Machine Design 1	MEC 307	1	3	1	0	4	4

Language of Instruction	English
Course Status	Compulsory
Course Level	Bachelor
Learning and Teaching Techniques of the Course	Lecture, Discussion, Question Answer, Practice

Course Objective

1: At the end of this course, students will be able to formulate and analyze stresses and strains in machine elements and structures in 3-D subjected to various loads.
2: At the end of this course, students will be able to do tolerance analysis and specify appropriate tolerances for machine design applications.
3: At the end of this course, students will be able to apply multidimensional static failure criteria in the analysis and design of mechanical components..
4: At the end of this course, students will be able to apply multidimensional fatigue failure criteria in the analysis and design of mechanical components.
5: At the end of this course, students will be able to analyze and design structural joints.
6: At the end of this course, students will be able to analyze and design power transmission shafts carrying various elements with geometrical features.
7: At the end of this course, students will be able to analyze and design mechanical springs.
8: At the end of this course, students will be acquainted with standards, safety, reliability, importance of dimensional parameters and manufacturing aspects in mechanical design.
9: At the end of this course, students will be able to improve their technical report writing skills.

Learning Outcomes

1:

Ability to define the most critically stressed point in a machine component.

- Ability to analyze a 3-D stress state.

- Ability to analyze strains and deflections.

2:

- Ability to understand and to interpret tolerance on a dimension.

- Acquaintance with ISO system of tolerances.

- Ability to specify an appropriate tolerance on machine components.

- Ability to specify a fit for mating parts considering functional requirements.

3:

- Knowledge of various multidimensional static failure criteria for different materials.

- Ability to apply multidimensional static failure criteria in the design and analysis of machine components.

- Ability to analyze and design components with non-uniform cross sections.

4:

- Knowledge of fatigue failure and load-life relation.

- Knowledge of various multidimensional fatigue failure criteria.

- Ability to apply multidimensional fatigue failure criteria in the design and analysis of machine components under various loading conditions.

5:

- Acquaintance with the terminology, and types of permanent and detachable joints.

- Ability to design and analyze permanent joints (riveted, welded, etc.) under concentric and eccentric loading conditions.

- Ability to design and analyze detachable joints (bolts, keys, pins, etc.) under various loading conditions.

- Ability to design and analyze power screws.

6:

- Acquaintance with different types of shafts.

- Ability to design and analyze shafts with different geometrical features under various loading conditions.

- Ability to calculate critical speed of shafts and make the design decisions accordingly.

7:

- Acquaintance with spring terminology and different types of springs.

- Ability to design and analyze coil springs (compression, tension, torsion) under various loads.

8:

- Knowledge of standards for machine elements.

- Understanding of safety and reliability concepts in the design of machine elements.

- Ability to minimize the characteristic dimension of a machine element.

- An understanding of the influence of manufacturing processes in the design of machine elements.

9:

- Ability to justify a design project in a formal report.

- Ability to perform and present design calculations in a neat and organized manner.

- Ability to present the outcomes of the design in the form of engineering drawings.

Course Outline
Stress analysis in 3-D. Tolerances and allowances. Static design criteria; stress concentration, factor of safety, theories of failure for ductile and brittle materials. Fatigue design criteria under mean and combined stresses. Design of shafts. Design of permanent joints; riveted joints, welded joints. Design of detachable joints, bolted joints, power screws, keys, splines, pins, rings. Design of springs.

Weekly Topics and Releated Preparation Studies		
Weeks	**Topics**	**Preparation Studies**
1	Tolerances and fits	

2	Stress analysis 3-D stress state Thick-walled cylinders Thermal stresses	
3	Bending of curved beams Contact stresses Strain energy and Castigliano's Theorem	
4	Static design criteria	
5	Static design criteria	
6	Fatigue design criteria	
7	Fatigue design criteria	
8	Midterm exam	
9	Fatigue design criteria	
10	Design of shafts	
11	Design of shafts	
12	Design of permanent joints	
13	Design of permanent joints	
14	Design of detachable joints	
15	Design of detachable joints	
16	**Final Exam**	

Textbook(s)/References/Materials:
"Shigley's Mechanical Engineering Design", R. G. Budynas, J. K. Nisbett, 10th Edition in SI Units

Assessment		
Studies	**Number**	**Contribution margin (%)**
Attendance	14	10
Lab		
Application		
Field Study		
Course-Specific Internship (if any)		
Quizzes / Studio / Critical		
Homework		
Presentation		
Projects	1	20
Report		
Seminar		
Midterm Exams / Midterm Jury	1	30
General Exam / Final Jury	1	40
	Total	**100**
Success Grade Contribution of Semester Studies		60
Success Grade Contribution of End of Term		40
	Total	**100**

Relationship Between Course Learning Outcomes and Program Competencies							
Nu	**Learning Outcomes**	**Contribution Level**				
		1	**2**	**3**	**4**	**5**
1	An ability to apply knowledge of science, mathematics, and engineering.					x
2	An ability to design static systems, components, or processes to meet industrial needs.					x
3	An ability to work with multi-disciplinary teams.					x
4	An ability to identify, formulate, and solve engineering problems.					x
5	Take responsibility to solve unpredictable and complex problems encountered in applications as an individual and as a member of a team			x		
6	Plan and manage activities in teamwork			x		
7	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.				x	
8	Can do research on interdisciplinary fields.			x		

ECTS / Workload Table

Activities	Number	Duration (Hours)	Total Workload
Course hours (Including the exam week: 16 x total course hours)	16	3	48
Laboratory			
Application			
Course-Specific Internship			
Field Study			
Study Time Out of Class	14	2	28
Presentation / Seminar Preparation			
Projects			
Reports			
Homeworks			
Quizzes / Studio Review	5	2	10
Preparation Time for Midterm Exams / Midterm Jury	1	15	15
Preparation Period for the Final Exam / General Jury	1	15	15
Total Workload			**116**