Machine Elements II

Course Code:

ME 344

Course Period:

Spring

Course Type:

Core

Credits:

3

Theoric:

2

Practice:

2

Laboratory Hour:

0

ECTS:

6

Prerequisite Courses:

Machine Elements I [1]
Course Language:

English

Courses given by:

Namik Çıblak [2]
Course Objectives:

This class is a continuation of ME 343 (Machine Elements I). The main objective of this course is to teach modern and classical approaches to design of standard and common mechanical components. In this class students learn about applications of knowledge of

statics, dynamics, strength of materials, introductory fluid mechanics, heat transfer, and design theories to particular mechanical components. This course makes the student able to perform analyses of standard mechanical components, select satisfactory components to be used in particular design cases, obtain an introductory perspective on the overall design of complex mechanical subsystems. A more important result is to develop skills, understanding, and methods that can be used in the design of any mechanical element, including those not covered in this class.

Course Content:

Shafts and axles. Design of nonpermanent joints, screws and fasteners. Design of permanent joints welding and bonding. Mechanical springs. Bearings, rolling-contact bearings. Lubrication and journal bearings. Gears, nomenclature, Spur and helical gears, bevel and worm gears, clutches, brakes, couplings, and flywheels, flexible mechanical elements.

Course Methodology:

1: Lecture, 2: Problem session, 3: Homework,4: Project, 11: Demonstration

Course Evaluation Methods:

A: Written exam, C: Homework, H: Attendance record

Course Learning Outcomes	**Program Learning Outcomes**	**Teaching Methods**	**Assessment Methods**
1) Ability to construct a design strategy for common mechanical elements.	1	1,2,3,4	A,C,D,H
2) Ability to perform strain and stress analysis, introductory fluid dynamics analysis in mechanical components and relate design variables with the strength and the cost of the component.	1	1,2,3,4	A,C,D,H
3) A good understanding of roles of mechanical components in functioning machines.	1,2	1,4,11	H,G
4) Ability to perform analysis of shafts, permanent and non-permanent joints, springs, bearings, lubrication, gears, clutches, breaks, couplings and flywheels and flexible mechanical systems.	1,2	1,2,3,4	A,C,D,H
5) Gaining a perspective on the overall design of complex mechanical subsystems.	1,2	1,4,11	A,C,D,H

COURSE CONTENT		
Week	**Topics**	**Study Materials**
1	Introductıon, stress analysis for shafts and axels	Textbook
2	Design layout of shaft and selection of shaft components	Textbook
3	Design of power screws, fasteners and nonpermanent joints.	Textbook
4	Welding, bonding and the design of permanent joints	Textbook
5	Welding, bonding and the design of permanent joints; Midterm exam 1.	Textbook
6	Mechanical Springs	Textbook
7	Bearing nomenclature, rolling contact bearings.	Textbook
8	Bearing selection, lubrication, journal bearings	Textbook
9	Lubrication, journal bearings; midterm exam 2.	Textbook
10	Gears nomenclature, spur and helical gears	Textbook
11	Bevel and worm gears	Textbook
12	Clutches and breaks.	Textbook
13	Couplings and flywheels.	Textbook
14	Flexible mechanical elements	Textbook

RECOMMENDED SOURCES	
Textbook	Shigley's Mechanical Engineering Design, Budynas & Nisbett, 8.ed, SI Edition, McGraw-Hill.
Additional Resources	

ASSESSMENT		
IN-TERM STUDIES	**NUMBER**	**PERCENTAGE**
In-term exams	2	30
Project	1	25
Attendance	56 class hrs	5

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	Hrs per Quantity	Total Workload (Hour)
Course Duration (12.5 weeks excluding 1.5 weeks for exams)	12.5	4	50
Off-the-classroom study (pre-study, practice for 14 weeks)	14	6	84
In-term exams	2	2	4
Homework	5	2	10
Final examination	1	3	3
Total Work Load			151
Total Work Load / 25 (h)			6.01
ECTS Credit of the Course			6