Module (Machine Design II) Catalogue

2023-2024

College/ Institute	**Erbil Technical Engineering College**
Department	**Mechanical and Energy Engineering Techniques**
Module Name	**Machine Design II**
Module Code	**MAD803**
Degree	**Technical Diploma** ☐ **Bachler** ■ **High Diploma** ☐ **Master** ☐ **PhD** ☐
Semester	**Eight**
Qualification	**PhD in Mechanical Engineering**
Scientific Title	**Lecturer**
ECTS (Credits)	**6**
Module type	**Prerequisite** ☐ **Core** ■ **Assist.** ☐
Weekly hours	3 hrs	
Weekly hours (Theory)	(3) hr Class	(165) Total hrs Workload
Weekly hours (Practical)	( ) hr Class	( )Total hrs Workload
Number of Weeks	12 weeks
Lecturer (Theory)	Dr. Dlair O. Ramadan
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Lecturer (Practical)	
E-Mail & Mobile NO.	
Websites	

Course Book

Course Description	As mentioned in the first Module Catalogue, machine design is the first course in an in-depth, two-course series focusing on machine design. The series covers fundamental mechanical design topics, such as static and fatigue failure theories, the analysis of shafts, fasteners, and gears, and the design of mechanical systems, such as gearboxes. In the first course, these topics were covered such as reviewing critical material properties in design, deflection and stiffness, and static failure theories of ductile materials and many other topics. In this course (Machine Design II), you will learn about static failure theories of brittle materials, fatigue failure resulting from variable loading, as well as the design of some mechanical elements such as shafts, screws, springs, and rolling contact bearings.

It is very important to emphasize that this course is similar to the first, which is a problem-oriented class, and the only way that the material can be mastered is with practice solving problems in addition to homework problems. |
| **Course objectives** | The information provided in this course aims to introduce you to the:

- Design of mechanical systems comprising such core machine elements, requiring analysis of motion, forces, and moments at the system level as well as design of individual components.
- Design of core machine elements such as shafts, bearings, fasteners, belts, pressure vessels, springs, and gears

To achieve this, we will review the general concepts of force, stress, motion, and failure analysis first, followed by topics in the design of specific machine elements. There will be a decent amount of problem solving by hand calculations, followed by design of a mechanical |

		system as a group project through hand and computer-assisted calculations.			
Student's obligation		- Homework will be assigned periodically. - Students are responsible to do homework on their own. - There will be several quizzes during the academic year, not necessarily announced. The quiz contains the materials covered in previous lectures, homework or to be covered that day. - Any quiz or test missed without a supported documented and excused absence will represent a zero. - Attendance and participation in the lecture are mandatory and will be considered in the grading. - Students should bring calculators, rulers, pen and pencils to be used during the lectures.			
Required Learning Materials		Data show and whiteboard are used throughout the lectures and the lecture notes will be uploaded to the Moodle or Telegram platform before the lecture day.			

		Task	Weight (Marks)	Due Week	Relevant Learning Outcome
Evaluation		Paper Review			
	Assignments	Homework	**10%**		
		Class Activity	**2%**		
		Report	**8%**		
		Seminar	**8%**		
		Essay			
		Project			
	Quiz		**8%**		
	Lab.				
	Midterm Exam		**24%**		
	Final Exam		**40%**		
	Total		**100%**		
Specific learning outcome:		By the end of the year, the student should be able to demonstrate ability to: Apply knowledge of mathematics, science, and engineering			

	• Design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, manufacturability, and sustainability. • Identify, formulate, and solve engineering problems. • Use the techniques, skills, and modern engineering tools necessary for engineering practice.
Course References:	• Shigley's Mechanical Engineering Design • Machine Design: An Integrated Approach by Norton

Course topics (Theory)	Week	Learning Outcome
Design of Mechanical Elements- Shafts and Shaft Components	1	
Design of Mechanical Elements- Mechanical Springs	2-3	
Design of Mechanical Elements- Rolling-Contact Bearings	4-6	
Design of Mechanical Elements- Lubrication and Journal Bearings	7-8	
Design of Mechanical Elements- Gears	9-11	
Design of Mechanical Elements- Clutches, Brakes, Couplings, and Flywheels	12-15	

Practical Topics	Week	Learning Outcome

Questions Example Design

Q¹: At a machined shaft shoulder the small diameter d is 1.100 in, the large diameter D is 1.65 in, and the fillet radius is 0.11 in. The bending moment is 1260 lbf · in and the steady torsion moment is 1100 lbf · in. The heat-treated steel shaft has an ultimate strength of Sut = 105 kpsi and a yield strength of S_y = 82 kpsi. The reliability goal is 0.99.

(a) Determine the fatigue factor of safety of the design using each of the fatigue failure criteria described in this section.

(b) Determine the yielding factor of safety.

Extra notes:

External Evaluator