Module (Machine Design I) Catalogue

2023-2024

College/ Institute	**Erbil Technical Engineering College**	
Department	**Mechanical and Energy Engineering Techniques**	
Module Name	**Machine Design I**	
Module Code	**MAD705**	
Degree	**Technical Diploma** ☐ **Bachler** ■ **High Diploma** ☐ **Master** ☐ **PhD** ☐	
Semester	**Seven**	
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**	
E-Mail & Mobile NO.	**Dlair.o.ramadan@epu.edu.iq , 07702374010**	
Lecturer (Practical)		
E-Mail & Mobile NO.		
Websites		

Course Book

Course Description	Machine Design I 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 this first course, you will learn robust analysis techniques to predict and validate design performance and life. You will start by reviewing critical material properties in design, such as stress, and strength. Next, you will learn about static failure theories, such as von Mises theory. Finally, you will discover fatigue failure criteria for designs with dynamic loads, such as the input shaft in the transmission of a car. It is very important to emphasize that this 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.

<table>
<tr><td>Student's obligation</td><td colspan="5">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.</td></tr>
<tr><td>Required Learning Materials</td><td colspan="5">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.</td></tr>
<tr><td rowspan="11">Evaluation</td><td colspan="2">Task</td><td>Weight (Marks)</td><td>Due Week</td><td>Relevant Learning Outcome</td></tr>
<tr><td colspan="2">Paper Review</td><td></td><td></td><td></td></tr>
<tr><td rowspan="6">Assignments</td><td>Homework</td><td>10%</td><td>2/11</td><td></td></tr>
<tr><td>Class Activity</td><td>2%</td><td></td><td></td></tr>
<tr><td>Report</td><td>8%</td><td>30/11</td><td></td></tr>
<tr><td>Seminar</td><td>8%</td><td>4/12</td><td></td></tr>
<tr><td>Essay</td><td></td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Quiz</td><td>8%</td><td>Every Lecture</td><td></td></tr>
<tr><td colspan="2">Lab.</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Midterm Exam</td><td>24%</td><td>5/11-10/11</td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>40%</td><td>11/12-22/12</td><td></td></tr>
<tr><td colspan="2">Total</td><td>100%</td><td></td><td></td></tr>
<tr><td>Specific learning outcome:</td><td colspan="5">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,</td></tr>
</table>

	social, political, ethical, health and safety, manufacturability, and sustainability. • Function on multi-disciplinary teams. • Identify, formulate, and solve engineering problems. • Use the techniques, skills, and modern engineering tools necessary for engineering practice. • Understand professional and ethical responsibility.
Course References:	• Shigley's Mechanical Engineering Design • Machine Design: An Integrated Approach by Norton

Course topics (Theory)	**Week**	**Learning Outcome**
Introduction to Mechanical Engineering Design	1	
Materials	2-3	
Load and Stress Analysis	4-6	
Deflection and Stiffness	7-8	
Failures resulting from static loading	9-11	
Fatigue Failure resulting from Variable loading	12-15	
Practical Topics	**Week**	**Learning Outcome**

Questions Example Design

Q[1]: A rod with a cross-sectional area of A and loaded in tension with an axial force of P=2000 lbf undergoes a stress of $\sigma = P/A$. Using a material strength of 24 kpsi and a design factor of 3.0, determine the minimum diameter of a solid circular rod. Using Table A–17, select a preferred fractional diameter and determine the rod's factor of safety. ***(8 marks)***

Extra notes:

External Evaluator