



# Course Specification

— (Bachelor)

**Course Title:** Mechanical Engineering Design-I

**Course Code:** 341-MEC-3

**Program:** Bachelor of Science in Engineering

**Department:** Mechanical Engineering

**College:** College of Engineering

**Institution:** Najran University

**Version:** 1.0

**Last Revision Date:** 02/27/2024



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## A. General information about the course:

### 1. Course Identification

1. Credit hours: 3

#### 2. Course type

A.  University  College  Department  Track  Others  
 B.  Required  Elective

3. Level/year at which this course is offered: Fourth Year \ Level 7

#### 4. Course general Description:

Introduction to Design Process & Phases of Design, Design Factors, Margin of Safety, Working Stresses, Theories of Failures, Design of Riveted and Welded Joints, Cotter and Knuckle Joint. Design against Fatigue, Factors affecting Fatigue, Stress Concentration, Notch Sensitivity, Practical Measures to Combat Fatigue. Design of Screw Joints under Tension and Shear, Eccentrically Loaded Screws, Friction and Efficiency. Clutches and Brakes: Function of Clutches, Friction and Limiting Torque, Theories of Uniform Pressure and Wear, Single and Multiple Plate Clutch, Cone Clutch, Centrifugal Clutch, Types of Brakes, Lining Material, Actuating Mechanism, Leading and Trailing Shoe Brakes, Disk Brake. Springs: Types of Springs, Tension and Compression Springs, Design of Helical Spring, Leaf Spring, Combination in Series and Parallel, Design of Thin and Thick Pressure Vessels, Lames Equation, Compound Vessels, Spherical Vessels

#### 5. Pre-requirements for this course (if any):

213-MEC-3(Mechanics of Materials)

#### 6. Co-requisites for this course (if any):

NIL

#### 7. Course Main Objective(s):

1. Identify the different stages of designing machine components.
2. Design against different loading conditions such as fatigue and stress concentration.
3. Design different types of key and joints under different loading conditions.
4. Design the different brakes, clutches and springs for moving machinery.
5. Design various types of pressure vessels for different work conditions



## 2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> <li>Traditional classroom</li> <li>E-learning</li> </ul>		
4	Distance learning		

## 3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	15
5.	Others (specify)	
<b>Total</b>		<b>60</b>

## B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Demonstrate various aspects of fundamentals of Design and Develop a practical understanding of Machine and Designing of Machine Elements	1	TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each	-Test performance evaluation -Evaluation of participation in discussion and group assignments



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			<p>chapter with the CLO.</p> <p>TS:4 – Conducting quizzes from each chapter</p> <p>TS:5 – Giving more example programs in the lecture</p> <p>TS: 6 – Discussion with the students in the class hours</p>	
1.2	In the present state of the art technology, it is of prime importance to use mathematical modeling and software for designing Machine Elements	7	<p>TS:1-Interactive lectures using PowerPoint slides</p> <p>TS:2- Engaging the students in problem-based learning through tutorials</p> <p>TS: 3 – Associating the topics in each chapter with the CLO.</p> <p>TS:4 – Giving more assignment from each chapter</p> <p>TS:5 – Giving more example programs in the lecture</p> <p>TS: 6 – Discussion with the students in the class hours</p>	<p>-Test performance evaluation</p> <p>-Evaluation of participation in discussion and group assignments</p>
...				
2.0	<b>Skills</b>			
2.1	Ability to think critically and analytically and to develop tests in the	6	<p>TS:1-Interactive lectures using PowerPoint slides</p>	<p>•Locally Developed Exams such as Quiz, Mid &amp;</p>



Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	areas covered at different levels.		<p>TS:2- Engaging the students in problem-based learning through tutorials</p> <p>TS: 3 – Associating the topics in each chapter with the CLO.</p> <p>TS:4 – Conducting quizzes from each chapter</p> <p>TS: 5 – Discussion with the students in the class hours</p>	<p>Final Exams with scoring rubrics</p> <ul style="list-style-type: none"> <li>•Assignments involving critical and logical thinking questions</li> <li>•Quizzes</li> </ul>
2.2	Ability to produce test items in areas studied, to retain information by understanding material and Decrease dependence on memorization	2	<p>TS:1-Interactive lectures using PowerPoint slides</p> <p>TS:2- Engaging the students in problem-based learning through tutorials</p> <p>TS: 3 – Associating the topics in each chapter with the CLO.</p> <p>TS:4 – Conducting quizzes from each chapter</p> <p>TS: 5 – Discussion with the students in the class hours</p>	<ul style="list-style-type: none"> <li>•Locally Developed Exams such as Quiz, Mid &amp; Final Exams with scoring rubrics</li> <li>•Assignments involving critical and logical thinking questions</li> <li>•Quizzes</li> </ul>
...				
3.0	<b>Values, autonomy, and responsibility</b>			
3.1	complete all assignments in due time and also participate in class	4	<p>TS:1-Interactive lectures using PowerPoint slides</p>	<p>Locally Developed Exams such as Quiz, Mid &amp;</p>





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	discussion and think critically		<p>TS:2- Engaging the students in problem-based learning through tutorials</p> <p>TS: 3 – Associating the topics in each chapter with the CLO.</p> <p>TS:4 – Conducting midterm and Final Exam from each chapter</p> <p>TS:5 – Giving more example programs in the lecture</p> <p>TS: 6 – Discussion with the students in the class hours</p>	<p>Final Exams with scoring rubrics</p> <ul style="list-style-type: none"> <li>•Assignments involving critical and logical thinking questions</li> <li>•Quizzes</li> </ul>
3.2	<p>Communicate, listen, negotiate, and evaluate their strengths and weaknesses as members of a team</p> <p>And defend their points of view and/or proposed solution to any problem based on the acquired knowledge.</p>	3	<p>TS:1-Interactive lectures using PowerPoint slides</p> <p>TS:2- Engaging the students in problem-based learning through tutorials</p> <p>TS: 3 – Associating the topics in each chapter with the CLO.</p> <p>TS:4 – Conducting midterm and Final Exam from each chapter</p> <p>TS:5 – Giving more example programs in the lecture</p>	<p>Locally Developed Exams such as Quiz, Mid &amp; Final Exams with scoring rubrics</p> <ul style="list-style-type: none"> <li>•Assignments involving critical and logical thinking questions</li> <li>•Quizzes</li> </ul>





Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
			TS: 6 – Discussion with the students in the class hours	
3.3	Description of the interpersonal skills and capacity to carry responsibility to be Developed	5	TS:1-Interactive lectures using PowerPoint slides TS:2- Engaging the students in problem-based learning through tutorials TS: 3 – Associating the topics in each chapter with the CLO. TS:4 – Conducting midterm and Final Exam from each chapter TS:5 – Giving more example programs in the lecture TS: 6 – Discussion with the students in the class hours	Locally Developed Exams such as Quiz, Mid & Final Exams with scoring rubrics •Assignments involving critical and logical thinking questions •Quizzes

### C. Course Content

No	List of Topics	Contact Hours
1.	Review of stress analysis (combined stress, bending).	8
2.	Materials in mechanical design and safety factors	8
3.	Power transmission gears	8
4.	Design of shafts, Design of springs,	8
5.	Design of ball bearing, sliding bearings	8
6.	Design of couplings, clutches, brakes, belts	6
7.	Design of riveted	6
8.	Design of welded	8
<b>Total</b>		<b>60</b>







## D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Assignments	1-10	10%
2.	Quizzes	1-10	10%
3.	Mid-term	4 & 8	30
4.	labs	-	-
5.	Final exam	15	50

\*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

## E. Learning Resources and Facilities

### 1. References and Learning Resources

Essential References	Mechanical Engineering Design by J. E. Shigley, C. R. Mischke, Tata McGraw Hill Publications. 2015
Supportive References	1.Machine Design by Paul H. Black and O. Eugene Adams, Auckland, McGraw hill Publications, 1968 2.Design of Machine Elements by V. B. Bhandari, Tata McGraw Hill Publications, 2010
Electronic Materials	Online custom books
Other Learning Materials	NA

### 2. Required Facilities and equipment

Items	Resources
<b>facilities</b> (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	<b>Classrooms and laboratories</b>
<b>Technology equipment</b> (projector, smart board, software)	--
<b>Other equipment</b> (depending on the nature of the specialty)	--

## F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of Students assessment	Students & Faculty	Direct, Indirect
Quality of learning resources	Students & Faculty	Direct and Indirect



Assessment Areas/Issues	Assessor	Assessment Methods
The extent to which CLOs have been achieved	Students & Faculty	Direct and Indirect
Other		Direct and Indirect

**Assessors** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

### G. Specification Approval

<b>COUNCIL /COMMITTEE</b>	<b>DEPARTMENT OF MECHANICAL ENGINEERING</b>
<b>REFERENCE NO.</b>	
<b>DATE</b>	<b>02/27/2024</b>

