

**The University of Jordan  
School of Engineering**



| Department             | Course Name       | Course Number | Semester |
|------------------------|-------------------|---------------|----------|
| Mechanical Engineering | Machine Design II | 0904436       |          |

**2019 Course Catalog Description**

Rolling contact bearings, selection, mounting and enclosure. Lubrication and journal bearings. Clutches, coupling and brakes. Gearing: Geometry, kinematics gear trains and force analysis. Design of spur, helical, bevel and worm gears. Multi-speed gear boxes. Design and analysis of belts, ropes, chains, term project. Case studies and applications.

**Instructors**

| Name | E-mail | Sec | Office Hours | Lecture Time |
|------|--------|-----|--------------|--------------|
|      |        |     |              |              |

**Text Books**

|                                 |                                         |  |
|---------------------------------|-----------------------------------------|--|
| <b>Title</b>                    | Shigley's Mechanical Engineering Design |  |
| <b>Author(s)</b>                | R. G. Budynas and J. K. Nisbett         |  |
| <b>Publisher, Year, Edition</b> | McGraw Hill, 2011, 9 <sup>th</sup> SI   |  |

**References**

|                       |                                                                                                                                                                                                                               |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Books</b>          | 1. R. C. Juvinall and K. M. Marshek (2006) Fundamentals of Machine Component Design, 4 <sup>th</sup> Ed. John Wiley & Sons.<br>2. R. L. Mott (1999) Machine Elements in Mechanical Design, 3 <sup>rd</sup> Ed. Prentice Hall. |
| <b>Journals</b>       | ASME Journal of Mechanical Design                                                                                                                                                                                             |
| <b>Internet links</b> | <a href="http://highered.mcgraw-hill.com/sites/0073529281/student_view0/">http://highered.mcgraw-hill.com/sites/0073529281/student_view0/</a>                                                                                 |

**Prerequisites**

|                                |                                                            |
|--------------------------------|------------------------------------------------------------|
| <b>Prerequisites by topic</b>  | Calculus, Vector Analysis                                  |
| <b>Prerequisites by course</b> | Machine Design (I) 0904435 + Mechanics of Machines 0904331 |
| <b>Co-requisites by course</b> | -                                                          |
| <b>Prerequisite for</b>        | Application in Mechanical Design 0904538                   |

**Topics Covered**

| Week  | Topics                                                                                                                                              | Chapter in Text | Sections |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------|
| 1-2   | Rolling contact bearing: types, load/life relations, combined loading, mounting and enclosure.                                                      | Chapter 11      |          |
| 3     | Lubrication and journal bearings: Lubrication and viscosity, Hydrodynamic theory, design considerations, pressure fed bearings.                     | Chapter 12      |          |
| 4-7   | Gears: types, involutes, contact ratio, interference, bevel, helical and worm gears, tooth systems, gear trains and force analysis.                 | Chapter 13      |          |
| 8-10  | Design of gears: Spur helical, bevel and worm gears.                                                                                                | Chapters 14+15  |          |
| 11-13 | Clutches, brakes couplings and flywheels: analysis and design of different types of clutches and brakes, energy considerations and flywheel design. | Chapter 16      |          |
| 14-15 | Flexible mechanical elements: Different types of belts, roller chains, ropes and flexible shafts.                                                   | Chapter 17      |          |

## Mapping of Course Outcomes to ABET Student Outcomes

| SOs | Course Outcomes                                                                                                                                                                                                                            |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2   | 1. Design and analysis of Ball, Roller and Journal Bearings<br>2. Design and analysis of Spur, Bevel, Helical and Worm gear train systems.<br>3. Design and analysis brakes and clutches<br>4. Design and analysis belts, chains and ropes |
| 7   | 5. Ability to look up new machine elements and utilize them in a machine design.                                                                                                                                                           |

## Evaluation

| Assessment Tools    | Expected Due Date | Weight |
|---------------------|-------------------|--------|
| Quiz                |                   | 10%    |
| First Midterm Exam  |                   | 20%    |
| Second Midterm Exam |                   | 20 %   |
| Final Exam          |                   | 50 %   |

### Contribution of Course to Meet the Professional Components

The course contributes to building the skills of design and selection of basic machine components, dealing with engineering standards and converting open-ended problems into a set of design specifications.

## Relationship to Student Outcomes

| SOs          | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|--------------|---|---|---|---|---|---|---|
| Availability |   | X |   |   |   |   | X |

### Relationship to Mechanical Engineering Program Objectives (MEPOs)

| MEPO1 | MEPO2 | MEPO3 | MEPO4 | MEPO5 |
|-------|-------|-------|-------|-------|
|       |       |       |       |       |

## ABET Student Outcomes (SOs)

|   |                                                                                                                                                                                                                                            |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics                                                                                                  |
| 2 | An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors                   |
| 3 | An ability to communicate effectively with a range of audiences                                                                                                                                                                            |
| 4 | An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts |
| 5 | An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives                                                 |
| 6 | An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions                                                                                                |
| 7 | An ability to acquire and apply new knowledge as needed, using appropriate learning strategies                                                                                                                                             |

Updated by ABET Committee, 2024