# The University of Jordan
# School of Engineering

| Department | Course Name | Course Number | Semester |
|---|---|---|---|
| Mechanical Engineering | Dynamics | 0904222 | |

## 2019 Course Catalog Description

Kinematics of particles, Rectilinear and curvilinear motion in various coordinate systems. Kinetics of particles, Newton's second law, Central force motion, Work-energy equation, Principle of impulse and momentum, Impact, Conservation of energy and momentum, Application to a system of particles. Kinematics of rigid bodies, Relative velocity and acceleration, Instantaneous center, Analysis in terms of a parameter. Plane kinetics of rigid bodies with application of Newton's second law, Energy and angular impulse impulse-angular momentum.

## Instructors

| Name | E-mail | Sec | Office Hours | Lecture Time |
|---|---|---|---|---|
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## Text Books

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|---|---|---|
| **Title** | Mechanics for Engineers: Dynamics | |
| **Author(s)** | R. C. Hibbeler, Kai beng Yap | |
| **Publisher, Year, Edition** | Pearson, 2016, Fourteenth Edition, (SI Units) | |

## References

| | |
|---|---|
| **Books** | 1. Ferdinand P. Beer, E Russell Johnston, William E. Clausen (2007) Vector Mechanics for Engineers; Dynamics, Eighth Edition (SI Units). McGraw Hill.<br>2. J. L. Meriam, L. G. Kraige (2007) Engineering Mechanics; Dynamics, Sixth Edition. John Wiley& Sons. |
| **Journals** | |
| **Internet links** | www.masterinengineering.com/support (publisher website) |

## Prerequisites

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|---|---|
| **Prerequisites by topic** | Calculus, Vector Analysis |
| **Prerequisites by course** | Statics 0901241 |
| **Co-requisites by course** | - |
| **Prerequisite for** | Mechanics of Machines, Mechanical Vibration |

## Topics Covered

| Week | Topics | Chapter in Text | Sections |
|---|---|---|---|
| 1-2 | Kinematics of Particles | 12 | 1-2, 4-7, 9-10 |
| 3-4 | Kinetics of Particles: Force and Acceleration | 13 | 1-5 |
| 5-6 | Kinetics of Particles: Work and Energy | 14 | 1-6 |
| 7-8 | Kinetics of Particles: Impulse and Momentum | 15 | 1-3, 5-7 |
| 9-10 | Planar Kinematics of Rigid Bodies | 16 | 1-8 |
| 11-12 | Planar Kinetics of Rigid Bodies: Force and Acceleration | 17 | 1-5 |
| 13-14 | Planar Kinetics of Rigid Bodies: Work and Energy | 18 | 1-5 |
| 15 | Planar Kinetics of Rigid Bodies: Impulse and Momentum | 19 | 1-3 |

## Mapping of Course Outcomes to ABET Student Outcomes

| SOs | Course Outcomes |
|---|---|
| 1 | 1. Studying rectilinear and curvilinear motion of particles<br>2. Studying relative motion using translating axes<br>3. Drawing free body diagram for particles and rigid bodies<br>4. Performing velocity and acceleration analysis of mechanisms using vector analysis approach<br>5. Performing angular motion analysis using scalar approach<br>6. Applying angular motion analysis to rigid bodies and mechanisms<br>7. Understanding Planar kinematics of rigid bodies (translation and rotation)<br>8. Studying relative motion analysis using rotating axes<br>9. Applying Equation of motion using Newton's second law to particles and rigid bodies<br>10. Formulation of motion using Work and Energy and Impulse and Momentum principles<br>11. Applying Force and Acceleration to planar kinetics of rigid bodies<br>12. Performing angular velocity analysis using instantaneous center of rotation |

## Evaluation

| Assessment Tools | Expected Due Date | Weight |
|---|---|---|
| **Midterm Exam** | | 30 % |
| **Assignments** | | 20 % |
| **Final Exam** | | 50 % |

## Contribution of Course to Meet the Professional Components

The course offers students the chance to build their skills in formulating and performing kinematics and kinetics analysis of particles and rigid bodies. In addition, it is needed for the higher-level courses like Mechanics of Machines, Mechanical Vibrations and other graduate courses.

## Relationship to Student Outcomes

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

## Relationship to Mechanical Engineering Program Objectives (MEPOs)

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

## ABET Student Outcomes (SOs)

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|---|---|
| **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, 2021**