

King Fahd University of Petroleum & Minerals

MECHANICAL ENGINEERING DEPARTMENT

ME 201: Dynamics

Catalogue Description: (3-0-3)

Kinematics of rectilinear and curvilinear motion of particles. Dynamics of particles and systems of particles. Kinematics of rotation and plane motion of rigid bodies. Work and energy relations. Impulse and momentum principles. Dynamics of rigid bodies in plane motion.

Status in Curriculum (Required or Elective): Required (offered Fall & Spring)

Prerequisites: CE 201

Co-requisites: None

Prerequisites by Topics:

- Equilibrium of particles and rigid bodies in two and three dimensions (CE 201)
- Definition of moment and couple (CE 201)
- Friction forces and their applications (CE 201)
- Center of gravity, moment of inertia, and radius of gyration (CE 201)

Textbook: **Engineering Mechanics: Dynamics**, by R.C. Hibbeler, 13th Edition in SI Units, Prentice Hall 2013.

References:

- 1) **Engineering Mechanics-Dynamics**, J.L. Meriam and L.G. Kraige, 7th Edition, Wiley 2012.
- 2) **Vector Mechanics for Engineers: Statics and Dynamics**, F. Beer, R.E. Johnston Jr, D. Mazurek, P. Cornwell, 10th Edition, McGraw Hill 2013

Coordinator: **Dr. Khaled Al-Athel**, Assistant Professor of Mechanical Engineering

Goals:(general objectives)

This course is designed to introduce students to kinematics and kinetics of particles and rigid bodies. Students will learn how to relate forces to acceleration using Newton's second law, to displacement using principle of work and energy, and to time using principle of impulse and momentum.

Course Outline (Lecture Topics):

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| 1. Kinematics of a Particle | (8 hours) |
| 2. Kinetics of a Particle: Force and Acceleration | (5 hours) |
| 3. Kinetics of a Particle: Work and Energy | (5 hours) |
| 4. Kinetics of a Particle: Impulse and Momentum | (5 hours) |
| 5. Planar Kinematics of a Rigid Body | (7 hours) |
| 6. Planar Kinetics of a Rigid Body: Force and Acceleration | (5 hours) |
| 7. Planar Kinetics of a Rigid Body: Work and Energy | (5 hours) |
| 8. Planar Kinetics of a Rigid Body: Impulse and Momentum | (5 hours) |

Design Activities/Projects:

Course has no projects or design problems.

Computer Usage:

Students are encouraged to use Working Model 2D software to model and visualize motion of rigid bodies.

Laboratory: None

Assessment Tools:

- i- Mid-term Examinations
- ii- Homework Assignments
- iii- Quizzes
- iv- Final Exam

Course Learning Outcomes:

- I- Students shall gain understanding of kinematics of particles and rigid bodies in rectilinear and curvilinear motion using different coordinate systems
- II- Students shall be able to analyze and solve dynamics problems using Newton's 2nd law of motion
- III- Students shall be able to analyze and solve dynamics problems using work and energy methods
- IV- Students shall be able to analyze and solve dynamics problems using the impulse and momentum methods
- V- Students shall be able to analyze the mechanics of impact

Course Learning Outcomes mapped to ME Program Outcomes:

Student Outcomes	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>	<i>j</i>	<i>k</i>
Course-to-Student outcome mapping	I-V				I-V						I-V
Emphasis*	S				M						M

* L: Little/None M: Moderate S: Strong

Status of Continuous Improvement review of this Course:

Date reviewed: -----
Prepared by: Dr. Khaled Al-Athel

Reviewed by: Dynamics Group
Date prepared: March 8, 2015