

MET 301: Applied Dynamics

(Required)

Course Description: MET 301: Applied Dynamics LT: 2 LB: 3 CR: 3

This course covers the fundamentals of kinematics and dynamics of particles and planar rigid bodies. The accelerated motion is analyzed using equation of motion with different coordinate systems. Drawing free-body diagrams as well as kinetic diagrams are strongly emphasized throughout the course. Work and energy principle and impulse and momentum principle are introduced and used extensively in the analysis of motion for both particles and rigid bodies.

Prerequisite: Nil

Co-requisite: MATH 201-APPLIED DIFFERENTIAL EQUATIONS

Textbook:

- MET 301-Applied Dynamics - Laboratory Manual
- Engineering Mechanics, Statics & Dynamics, R. C. Hibbeler, Tenth Edition, Prentice Hill, 2004

References: Vector Mechanics for Engineers, Dynamics, by P. Beer and E. R. Johnston, Sixth Edition, McGraw Hill, 1997

Course Learning Objectives: To enable the students to:

1. Describe the motion of a particle along a straight line and along a curved path using different coordinate systems in order to specify its position, velocity and acceleration at any instant.
2. Classify various types of rigid-body planar motion and describe the motion through the analysis of velocity and acceleration
3. Develop the kinetic equations of motion to analyze the motion of particles and symmetric rigid bodies acted upon by unbalanced forces
4. Understand the principle of work and energy and apply it to solve particle and rigid body planar kinetic problems that involve force, velocity and displacement
5. Understand the principle of impulse and momentum and apply it to solve particle and rigid body planar kinetic problems that involve force, velocity and time

Course Outline:

[I] Modules:

Module	Topic	Duration
1.	Kinematics of a Particle	1-2 week
2.	Kinetics of a Particle : Force and Acceleration	3-4 weeks
3.	Kinetics of a Particle : Work and Energy	3 week
4.	Kinetics of a Particle : Impulse and Momentum	6-7 week
5.	Planer Kinematics of a Rigid Bodies	8-9 weeks

6.	Planer Kinetics of a Rigid Body: Force and acceleration	10-11 weeks
7.	Planar Kinetics of a Rigid Body: Work and Energy	12 week
8.	Planar Kinetics of a Rigid Body: Impact and Momentum	13-14 weeks

[II] Laboratory Work/Projects:

Exercise	Topic	Duration
1.	Tutorial 1: Kinematics of a Particle : Rectilinear Motion	1 week
2.	Tutorial 2: Kinematics of a Particle : Curvilinear Motion	1 week
3.	Tutorial 3: Kinetics of a Particle : Force and Acceleration	1 week
4.	Tutorial 4: Kinetics of a Particle : Force and Acceleration	1 week
5.	Tutorial 5: Kinetics of a Particle : Work and Energy	1 week
6.	Tutorial 6: Kinetics of a Particle : Impulse and Momentum	1 week
7.	Tutorial 7: Kinetics of a Particle : Impulse and Momentum	1 week
8	Tutorial 8: Planar Kinematics of a Rigid Body	1 week
9	Tutorial 9: Planar Kinematics of a Rigid Body	1week
10.	Tutorial 10: Planar Kinetics of a Rigid Body : Force and Acceleration	2 weeks
11.	Tutorial 11: Planar Kinetics of a Rigid Body : Work and Energy	1 week
12	Tutorial 12: Planar Kinetics of a Rigid Body : Impulse and Momentum	2 weeks

Evaluation Methods:

1. Major exams and a final exam.
2. Assignments, quizzes and home works

Course Learning Outcomes:

The expected learning outcome is that the students will be able to:

1. Describe the motion of a particle along a straight line and along a curved path using different coordinate systems in order to specify its position, velocity, and acceleration at any instant.
2. Classify various types of rigid-body planar motion and describe the motion through the analysis of velocity and acceleration
3. Develop the kinetic equations of motion to analyze the motion of particles and symmetric rigid bodies acted upon by unbalanced forces.
4. Understand the principle of work and energy and apply it to solve particle and rigid-body planar kinetic problems that involve force, velocity and displacement.



5. Understand the principle of impulse and momentum and apply it to solve particle and rigid-body planar kinetic problems that involve force, velocity and time.

Prepared by:

Dr. Hesham Elkaranshawy

Feb . 2009

