

Professor H. L. Wong

## Engineering Mechanics II: Dynamics

| How well did you learn? |   |   |   |   |
|-------------------------|---|---|---|---|
| Not at all → Very Well  |   |   |   |   |
| 1                       | 2 | 3 | 4 | 5 |

**CIRCLE YOUR RATINGS**

↓ BELOW ↓

| Course Objectives and Outcomes   |  |   |   |   |   |   |
|--|--|---|---|---|---|---|
| <b>Goal.</b> Elements of vector algebra; dynamics of particles, systems of particles and rigid bodies; kinematics; momentum relations, energy methods; vibrations; Euler's Equation of Motion. |  |   |   |   |   |   |
| <b>Objective.</b> To study vector algebra and vector Calculus in dynamics and transformation of coordinates.   |  |   |   |   |   |   |
| <b>Outcome.</b> The students will be able to:  |  |   |   |   |   |   |
| 1  | Express force and position vectors in Cartesian and polar vector form, determine unit vectors, vector operations, scalar and cross products. | 1 | 2 | 3 | 4 | 5 |
| 2  | Express transformations of coordinates as orthogonal matrices and perform such transformations.  | 1 | 2 | 3 | 4 | 5 |
| 3  | Determine the first and second time derivatives of vectors.  | 1 | 2 | 3 | 4 | 5 |
| <b>Objective.</b> To study the Kinematics of a particle in various coordinate systems.   |  |   |   |   |   |   |
| <b>Outcome.</b> The students will be able to:  |  |   |   |   |   |   |
| 4  | Learn and analyze the rectilinear and general curvilinear motion in Rectangular coordinate.  | 1 | 2 | 3 | 4 | 5 |
| 5  | Learn and analyze the motion of a projectile   | 1 | 2 | 3 | 4 | 5 |
| 6  | Learn and analyze the curvilinear motion in Normal and Tangential coordinate.  | 1 | 2 | 3 | 4 | 5 |
| 7  | Learn and analyze the curvilinear motion in Cylindrical coordinate.  | 1 | 2 | 3 | 4 | 5 |
| <b>Objective.</b> To study the Kinetics of a Particle under Newton's Laws of Motion.   |  |   |   |   |   |   |
| <b>Outcome.</b> The students will be able to:  |  |   |   |   |   |   |
| 8  | Learn and analyze the equations of Motion in Rectangular, Normal-Tangential and Cylindrical  | 1 | 2 | 3 | 4 | 5 |
| 9  | Learn and analyze the equations of a system of particles.  | 1 | 2 | 3 | 4 | 5 |
| <b>Objective.</b> To study the Kinetics of a Particle in Alternate forms: Energy and Momentum  |  |   |   |   |   |   |
| <b>Outcome.</b> The students will be able to:  |  |   |   |   |   |   |
| 10   | Learn and analyze the Principle of Work and Energy of one and a system of particles.   | 1 | 2 | 3 | 4 | 5 |
| 11   | Learn and analyze Conservative forces, Potential Energy and Conservation of Energy.  | 1 | 2 | 3 | 4 | 5 |
| 12   | Learn and analyze the Principle of Linear Impulse and Momentum of one and a system of particles.   | 1 | 2 | 3 | 4 | 5 |
| 13   | Learn and analyze the Conservation of Linear Momentum for system of Particles.   | 1 | 2 | 3 | 4 | 5 |
| 14   | Learn and analyze Moment and Angular Impulse and Momentum Principles.  | 1 | 2 | 3 | 4 | 5 |
| <b>Objective.</b> To study the Kinematics and Kinetics of a Rigid Body   |  |   |   |   |   |   |
| <b>Outcome.</b> The students will be able to:  |  |   |   |   |   |   |
| 15   | Learn and analyze the Translation, Fixed-Axis Rotation and General Plane Motion of a Rigid Body.   | 1 | 2 | 3 | 4 | 5 |
| 16   | Learn and analyze the Instantaneous center of Zero Velocity.   | 1 | 2 | 3 | 4 | 5 |
| 17   | Learn and analyze the Plane Kinetic Equations of Motion.   | 1 | 2 | 3 | 4 | 5 |
| 18   | Learn and analyze the Three-Dimensional Equation of Motion and Fixed Axis Rotation of a Rigid  | 1 | 2 | 3 | 4 | 5 |
| 19   | Learn and analyze the Gyroscopic Motion of a Rigid Body.   | 1 | 2 | 3 | 4 | 5 |
| <b>Objective.</b> To learn to work with, and in specialized applications of, computers in the performance of job   |  |   |   |   |   |   |
| <b>Outcome.</b> The students will be able to:  |  |   |   |   |   |   |
| 20   | Use computational tools for matrix computation   | 1 | 2 | 3 | 4 | 5 |
| 21   | Use computational tools for the calculation of moment of inertia of irregular shapes.  | 1 | 2 | 3 | 4 | 5 |

## RELATIONSHIP OF CIVIL ENGINEERING PROGRAM COURSE OBJECTIVES TO OUTCOMES

**Objective.** The Civil Engineering program is designed to teach beyond the technical content of the curriculum and prepare the students to utilize what they learn in a professional setting. Engineering activities enlist skills and demonstrate ability to understand the subject matter and communicate in a proficient manner. This course contributes to the overall program goals in the following ways.

**Outcome.** Engineering programs must demonstrate that their students attain

|     |  |   |   |   |   |   |
|-----|--|---|---|---|---|---|
| (a) | an ability to apply knowledge of mathematics, science, and engineering.                                    | 1 | 2 | 3 | 4 | 5 |
| (e) | an ability to identify, formulate, and solve engineering problems.   | 1 | 2 | 3 | 4 | 5 |
| (i) | a recognition of the need for, and an ability to engage in life-long learning.                             | 1 | 2 | 3 | 4 | 5 |
| (k) | an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. | 1 | 2 | 3 | 4 | 5 |