

TKU211121

Classical Mechanics

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BASIC INFORMATION

Course Credit	2 / 100 minutes per Week
Course Type	Required
Course Classification	Basic Science
Prerequisites	High-School Level Physics

STUDENT AND LEARNING OUTCOMES

Covered Student Outcomes

Fundamental and Engineering Knowledge (KP.1)

Learning Outcomes

- LO1** Students are able to understand the concepts related to kinematics and dynamics of translational and rotational motion, and also related to static equilibrium.
- LO2** Students are able to understand the concepts related to energy and momentum.

COURSE DESCRIPTION

Classical Mechanics course discusses the concepts and theories related to classical mechanics such as Unit System, Vector, Kinematics and Dynamics of Translational and Rotational Motion, Statics, Energy and Momentum. High-school level physics is required for this course.

TOPICS

1. Unit, Physical Quantities and Vector

- 1.1 Standards and Units
- 1.2 Physical Dimension and Unit Consistency
- 1.3 Uncertainty and Significant Figures
- 1.4 Vector Operation

2. Linear and Circular Motion

- 2.1 1D Kinematics - Position, Velocity and Acceleration
- 2.2 Free Falling Bodies
- 2.3 2D Kinematics - Position, Velocity and Acceleration
- 2.4 Projectile Motion
- 2.5 Uniform and Non-uniform Circular Motion

3. Forces and Newton's Laws of Motion

- 3.1 Newton's Laws and their Applications
- 3.2 Free Body Diagram

- 3.3 Frictional and Resistive Forces
- 3.4 Newton's Second Law and Circular Motion

4. Work and Energy

- 4.1 Work
- 4.2 Kinetic and Potential Energy
- 4.3 Energy Conservation
- 4.4 Power

5. Momentum, Impulse and Collision

- 5.1 Momentum and Impulse
- 5.2 Conservation of Momentum and Collision
- 5.3 Center of Mass
- 5.4 Continuous Mass Transfer (Rocket Propulsion)

6. Rotation of Rigid Bodies

- 6.1 Rotational Kinematics
- 6.2 Rotational Kinetic Energy and Moment of Inertia
- 6.3 Torque and Angular Acceleration
- 6.4 Rolling Motion - Combined Rotational and Translational Motion
- 6.5 Angular Momentum and Conservation of Angular Momentum
- 6.6 Gyroscopes and Precession

7. Equilibrium and Elasticity

- 7.1 Center of Gravity
- 7.2 Equilibrium and Stability
- 7.3 Elasticity - Hooke's Law

REFERENCES

- [1] Young & Freedman, 2008, University Physics with Modern Physics, Addison-Wesley Publishing Co., Boston
- [2] Halliday-Resnick-Walker, 2004, Fundamentals of Physics, John Wiley & Sons, Inc., New York
- [3] Randall D. Knight, 2008, Physics for Scientists and Engineers, Addison-Wesley Publishing Co., Boston