FUTURE UNIVERSITY IN EGYPT جامعة المستقبل

Faculty of Engineering & Technology

Dynamics of Rigid Bodies (Mechanics3)

Information :

Course Code :	MEC 221	**Level :**	Undergraduate	**Course Hours :**	3.00- Hours

Department : Department of Petroleum Engineering

Instructor Information :

Title	Name	Office hours
Lecturer	Arafa Soliman Sobh Khalil Arafa	2

Area Of Study :

Enrich the student's knowledge about the fundamental principles of kinematics of a rigid body.
Prepare the student to analyze the concepts of planar motion and its types (translation, rotation and general plane motion) of a rigid body or systems of connected bodies using vector and scalar methods.
Train the student to represent and apply relations of position, velocity and acceleration for rolling motion problems.
Prepare the student to analyze the various principles of Kinetics such as forceacceleration, work-energy and the impulse-momentum principles for various types of problems that containing the motion of a rigid body.

Description :

Types of planar motion of rigid body: translation, rotation about a fixed axis and general motion. Angular velocity and angular acceleration, instantaneous center, relative velocity and relative acceleration. Knetics of rigid bodies, Newton's laws, friction and elastic forces, equations of motion. Principle of work and energy. Conservation forces and principle of conservation of mechanical energy. Principle of impulse and momentum, impulsive forces, impact. Introduction of free and forced vibrations.

Course outcomes :

a.Knowledge and Understanding: :	
1 -	Describe position, velocity and acceleration for a moving rigid body.
2 -	Define the equations of motion of a rigid body
3 -	Explain the analysis of work and energy, impulse and momentum methods.
b.Intellectual Skills: :	
1 -	Discriminate between different types of motion.
2 -	Formulate the kinematic and kinetic equations in order to describe the motion of the rigid body.
c.Professional and Practical Skills: :	
1 -	Design and perform experiments for motion studies.

d.General and Transferable Skills: :	
1 -	Work effectively in a team and develop the skills which are related to creative thinking, problem solver, and teamwork in different fields of the motion of rigid bodies.

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Planar kinematics of a rigid body	4	2	2
Vector and scalar methods for analysis	8	4	4
Analysis of connected rigid bodies	4	2	2
Rolling motion and applications.	4	2	2
Kinetics of a rigid body	4	2	2
Force-acceleration method of a rigid body	12	6	6
Work and energy of a rigid body	12	6	6
Impulse and momentum of a rigid body	8	4	4
Impact problems	4	2	2

Teaching And Learning Methodologies :

Interactive Lecturing
Problem solving
Discussion

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Assignment	10.00		
Final Exam	40.00		
Mid- Exam I	15.00		
Mid- Exam II	15.00		
Participation	10.00		
Quizzes	10.00		

Recommended books :

1- Beer F., Johnston R. and Claysen W., "Vector Mechanics for Engineering: Dynamics", McGraw Hill, 10th Edition, 2015.
2- Hibbeler R.C., "Engineering Mechanics: Dynamics", 13th Edition.
3- Riley W. and Sturges L, "Engineering Mechanics: Dynamics". 6th Edition