

Faculty of Engineering & Technology
Dynamics of Rigid Bodies (Mechanics3)

Information :

Course Code : MEC 221 **Level :** Undergraduate **Course Hours :** 3.00- Hours
Department : Department of Mechanical Engineering

Instructor Information :

Title	Name	Office hours
Lecturer	Amr Mohamed Metwally Ismaiel	8
Teaching Assistant	Amira Khaled Hasan Mohamed Elkodama	2

Area Of Study :

- Understand fundamentals of Mechanics of Rigid Bodies
- Apply the fundamental principles of Kinematics of Rigid Bodies
- Apply the fundamental principles of Kinetics of Rigid Bodies
- Understand fundamentals of Vibrations
- Share ideas and work in a team.

The student shall attain the above mentioned objectives efficiently under controlled guidance and supervision while gaining the experience through application and analysis of realistic system data.

Course outcomes :

a.Knowledge and Understanding: :

1 -	Identify basic applied and engineering science.
2 -	Identify principles in the of design of mechanical components, different materials, and manufacturing technologies in the field of mechanical power engineering and some other engineering disciplines.
3 -	Identify principles in the field of design of fluid flow, thermodynamics, gas dynamics, turbo- machinery, heat transfer engineering and fundamentals of thermal and fluid processes
4 -	Develop conceptual and detailed design of construction projects and fluid power systems.

b.Intellectual Skills: :

1 -	Define the mechanical power engineering problems and evaluate designs, processes, and performance and propose improvements.
2 -	Derive different solution alternatives for the engineering problems, analyze, interpret data and design experiments to obtain new data, and evaluate the power losses in the fluid transmission lines and networks
3 -	Analyze the performance of the basic types of internal combustion engines, hydraulic machines, fluid power systems, subsystems and various control valves and actuators. Analyze the solution alternatives and choose the optimum one.

c.Professional and Practical Skills: :

1 -	Use laboratory, workshop e4quipment and field devices competently and safely.
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2 -	Analyze the record data in the laboratory.
3 -	Prepare engineering drawings, computer graphics, and write specialized technical reports.
4 -	Write computer programs pertaining to mechanical power and energy engineering to describe the basic thermal and fluid processes mathematically, and use the computer software for their simulation and analysis.

d.General and Transferable Skills: :

1 -	Collaborate effectively within multidisciplinary team.
2 -	Share ideas, communicate effectively and work in stressful environment and within constraints.
3 -	Lead and motivate individuals and work with others according to the rules of the professional Ethics.
4 -	Use digital libraries and/or Learning systems and demonstrate efficient IT capabilities.

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Kinematics of Rigid Bodies Revision of Kinematics of Particles, Types of Rigid Body Motion			
Kinematics of Rigid Bodies Translation, Rotation About a Fixed Axis: Velocity and Acceleration, Equations Defining the Rotation of a Rigid Body About a Fixed Axis, Sample Problem 15.1			
Kinematics of Rigid Bodies Equations Defining the Rotation of a Rigid Body, General Plane Motion, Absolute and Relative Velocity in Plane Motion			
Kinematics of Rigid Bodies Instantaneous Center of Rotation in Plane Motion, Absolute and Relative Acceleration in Plane Motion			
Plane Motion of Rigid Bodies: Forces and Accelerations Introduction, Equations of Motion of a Rigid Body, Angular Momentum of a Rigid Body in Plane Motion			
Plane Motion of Rigid Bodies: Forces and Accelerations Problems Involving the Motion of a Rigid Body, Systems of Rigid Bodies, Constrained Plane Motion			
Plane Motion of Rigid Bodies: Energy and Momentum Methods Introduction, Principle of Work and Energy for a Rigid Body, Work of Forces Acting on a Rigid Body, Kinetic Energy of a Rigid Body in Plane Motion, Systems of Rigid Bodies, Conservation of Energy, Power			
Plane Motion of Rigid Bodies: Energy and Momentum Methods Principle of Impulse and Momentum, Systems of Rigid Bodies, Conservation of Angular Momentum, Impulsive Motion, Eccentric Impact			
Mechanical Vibrations Introduction, Free Vibrations , Forced Vibrations, Damped Vibrations			

Teaching And Learning Methodologies :

Lectures
Tutorials
Presentation & Discussion

Brain storming

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
1st -Mid-term examination	25.00	6	
2 nd -Mid-term examination	25.00	11	
Final examination	40.00	15	
General Performance	10.00	4	

Recommended books :

"Engineering Mechanics – Dynamics" , By R.C. Hibbeler Publisher: Pearson