



Course Specification

(Bachelor)

Course Title: Dynamics
Course Code: ME2134
Program: Mechanical Engineering
Department: Mechanical Engineering Department
College: College of Engineering & Architecture
Institution: Umm Al-Qura University
Version: Course Specification Version Number
Last Revision Date: Pick Revision Date.

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A. General information about the course:

1. Course Identification

1. Credit hours: (3)

2. Course type

- A. ☐ University ☐ College ☐ Department ☐ Track ☐ Others
B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: (4th level/2nd year)

4. Course General Description:

The course introduces dynamics and cover the fundamentals of formulation of dynamics problems. Kinematics of a particle, linear motion and trajectories of particles, plane motion (with cartesian, polar, normal-tangential coordinates), work, kinetic and potential energy, impulse and momentum, and rigid body kinematics & kinetics will be discussed in the course.

5. Pre-requirements for this course (if any):

Static CE1101.

6. Co-requisites for this course (if any):

None.

7. Course Main Objective(s):

Comprehensive understanding of kinematics of a particle, kinetics of a particle, introduction about rigid body dynamics linking the topics with a practical application and improve the reasoning skills for students.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	45	100
2	E-learning	Blackboard, Extra	Extra
3	Hybrid - Traditional classroom - E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)



No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	Extra
Total		45+

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Able to comprehensively understand of kinematics for a particle and rigid body.	K1, 1	• The lecture is delivered using Power Point and hands-out are provided if needed. • Extra on-line lectures are given through blackboard to cover and finish all topics if needed. • The students is strongly recommended to have the main text book. • Communcation between lecturer and students through e-mail is also opened for this purpose.	Quizzes. Midterm Exam. Final Exam. Oral Exam. If needed
1.2	Able to acquire right assessment and the reasoning skills for students through choosing the appropriate coordinate system.	K1, 1		
1.3	Able to comprehensively understand of kinetics for a particle and rigid body.	K1, 1		
1.4	Able to implement a good conceptual engineering design for dynamics through linking the topics with practical applications.	K1, 1		
2.0	Skills			
2.1				
2.2				
...				
3.0	Values, autonomy, and responsibility			
3.1				
3.2				



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
...				

C. Course Content

No	List of Topics	Contact Hours
1.	<u>INTRODUCTION</u> - Basic concept - Newton's Laws - Units - Math Review	3
2.	<u>KINEMATICS OF PARTICLES (Rectilinear Motion)</u> - Average velocity, average acceleration - Differential equations of motion - Constant velocity and acceleration and one-dimensional projectiles	3
3.	<u>KINEMATICS OF PARTICLES (Curvilinear Motion)</u> - Rectangular coordinates 2D Projectiles - Normal and tangential coordinates - Polar coordinates - Applications in 3D	6
4.	<u>KINEMATICS OF PARTICLES (Plane dependent or constrained motion)</u> - One degree of freedom system - Two degree of freedom system and more	3
5.	<u>KINEMATICS OF PARTICLES (Plane relative motion)</u> - Relative velocity - Relative acceleration	3
6.	<u>KINETICS OF PARTICLES (Newton second Law)</u> - Rectilinear motion - Plane curvilinear motion - Plane dependent motion	6
7.	<u>KINETICS OF PARTICLES (Work & Energy)</u> - Work - Kinetic Energy - Potential Energy - Power & Efficiency	5
8.	<u>KINETICS OF PARTICLES (Linear & Angular Impulse-Momentum)</u> - Equations of Linear & Angular Momentum - Linear & Angular Impulse - Impact: direct central and oblique	6
9.	<u>PLANAR KINEMATICS OF RIGID BODY DYNAMICS</u>	5





	• Rigid Body Motion (Translation, Rotation about a fixed axis, General plane motion) • Absolute and Relative Motion Analysis • Instantaneous Center of Zero Velocity • Motion Relative to Rotating Axes	
10.	PLANAR KINETICS OF RIGID BODY DYNAMICS • Force and Acceleration • Work and Energy • Impulse and Momentum	5
Total		45+

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	1-14	25%
2.	Midterm exam	8	25%
3.	Final exam	16-17	50%
4.	Oral exam if needed	15	Bonus

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	Russel C. Hibbeler, Engineering Mechanics: Dynamics.
Supportive References	J. L. Meriam & L. G. Kriage, Engineering Mechanics: Dynamics.
Electronic Materials	All the lecture notes
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
Facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	A lecture room with a capacity of 40 students per session is reasonable.
Technology equipment (projector, smart board, software)	Laptop and data show.
Other equipment (depending on the nature of the specialty)	





F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students and Program Leaders	direct and Indirect
Effectiveness of Students assessment	Students and Program Leaders	direct and Indirect
Quality of learning resources	Program Leaders	direct and Indirect
The extent to which CLOs have been achieved		
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	DR. HASSAN A. FADAG	
REFERENCE NO.		
DATE	JANUARY 19 TH , 2025	

