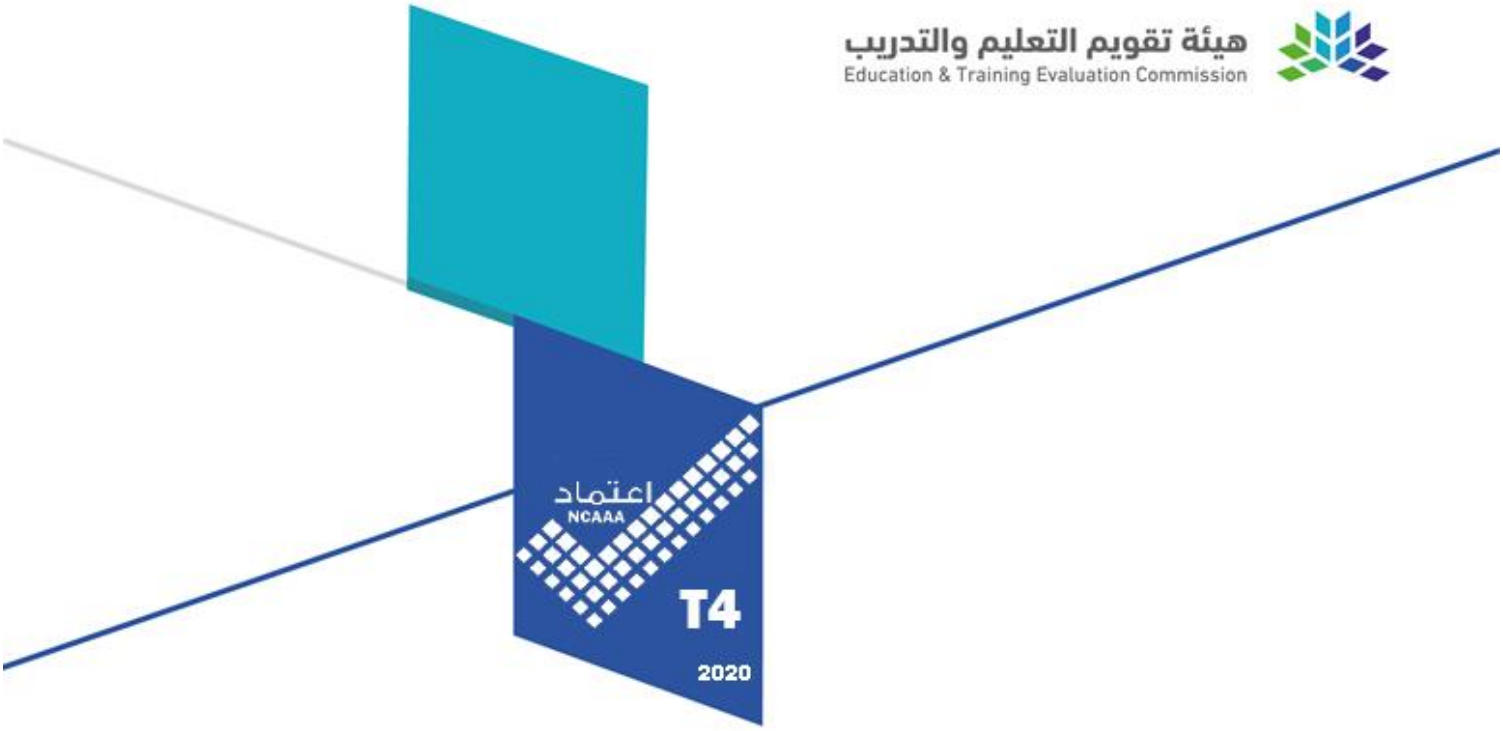
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	Dynamics
Course Code:	ME 301
Program:	Bachelor of Science
Department:	Mechanical Engineering (ME); Civil Engineering (CE)
College:	Jubail University College
Institution:	Jubail University College

Table of Contents

A. Course Identification

1. Credit hours:	3
2. Course type	
a.	University ☐ College ☐ Department ☑ Others ☐
b.	Required ☑ Elective ☐
3. Level/year at which this course is offered:	ME: Level 4, 2nd Year CE: Level 4, 2nd Year
4. Pre-requisites for this course (if any)**:**	CE 201 (Statics)
5. Co-requisites for this course (if any)**:**	None

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**		
2	**Blended**		
3	**E-learning**		100
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	45
2	**Laboratory/Studio**	0
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	45

B. Course Objectives and Learning Outcomes

1. Course Description

ME 301 Dynamics (3-0-3) ***Prerequisite: CE 201***

Kinematics of rectilinear and curvilinear motion of particles. Dynamics of particles and systems of particles. Kinematics of rotation and plane motion of rigid bodies. Work and energy relations. Impulse and momentum principles. Dynamics of rigid bodies in plane motion.

2. Course Main Objective

The main purpose of this course is to teach students application of Newton's laws of motion, work, energy and momentum principles to analyze motion and forces of particles and rigid bodies. In addition, this course is also aimed at letting the students learn how to distinguish different types of motion and decide appropriate technique to analyze motion of any given body.

3. Course Learning Outcomes

	CLOs	Aligned PLOs (SOs)
1	**Knowledge and Understanding**	
	N/A	
2	**Skills :**	
2.1	Analyze particle motions along different paths.	SO 1
2.2	Formulate equations of motion from freebody diagrams.	SO 1
2.3	Solve complex dynamic problems (force-acceleration-velocity-displacement of particles and rigid bodies) using dynamics concepts - Work-Energy principle, Impulse-Momentum principle and Newton's laws of motion.	SO 1
2.4	Identify appropriate dynamic concept to analyze displacement, velocity, and acceleration of rigid bodies.	SO 1
3	**Values:**	
	N/A	

C. Course Content

No	List of Topics	Contact Hours
1	**Unit 1. Kinematics of a Particle** Rectilinear Kinematics: Continuous Motion, Rectilinear Kinematics, Curvilinear (rectangular, Normal and Tangential, and Cylindrical Components), Motion of a Projectile, Absolute Dependent Motion Analysis of Two Particles, Relative-Motion of Two Particles Using Translating Axes.	9
2	**Unit 2. Kinetics of a Particle: Force and Acceleration** Newton's Second Law of Motion, The Equation of Motion, Equation of Motion for a System of Particles, Equations of Motion: (Rectangular, Normal and Tangential Coordinates), Central-Force Motion and Space Mechanics.	6
3	**Unit 3. Kinetics of a Particle: Work and Energy** The Work of a Force, Principle of Work and Energy, Principle of Work and Energy for a System of Particles, Power and Efficiency, Conservative Forces and Potential Energy, Conservation of Energy.	6
4	**Chapter 4. Kinetics of a Particle: Impulse and Momentum** Principle of Linear Impulse and Momentum, Principle of Linear Impulse and Momentum for a System of Particles, Conservation of Linear Momentum for a System of Particles, Impact, Angular Momentum, Relation Between Moment of a Force and Angular Momentum, Principle of Angular Impulse and Momentum.	6
5	**Unit 5. Planar Kinematics of a Rigid Body** Planar Rigid-Body Motion, Translation, Rotation about a Fixed Axis, Absolute Motion Analysis Relative-Motion Analysis: Velocity, Instantaneous Center of Zero Velocity, Relative- Motion Analysis: Acceleration, Relative-Motion Analysis using Rotating Axes	6
6	**Unit 6. Planar Kinetics of a Rigid Body: Force and Acceleration** Moment of Inertia, Planar Kinetic Equations of Motion, Equations of Motion: Translation, Equations of Motion: Rotation about a Fixed Axis, Equations of Motion: General Plane Motion.	6

7	**Unit 7. Planar Kinetics of a Rigid Body: Work and Energy** Kinetic Energy, The Work of a Force, The Work of a Couple, Principle of Work and Energy, Conservation of Energy	6
Total		

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
	N/A		
2.0	**Skills**		
2.1	Analyze particle motions along different paths.	• Independent learning • Interactive learning	•Assignments •Written exams (Quizzes, midterm & final)
2.2	Formulate equations of motion from freebody diagrams.	• Independent learning • Interactive learning	•Assignments •Written exams (Quizzes, midterm & final)
2.3	Solve complex dynamic problems (force-acceleration-velocity-displacement of particles and rigid bodies) using dynamics concepts - Work-Energy principle, Impulse-Momentum principle and Newton's laws of motion.	• Independent learning • Interactive learning	•Assignments •Written exams (Quizzes, midterm & final)
2.4	Identify appropriate dynamic concept to analyze displacement, velocity, and acceleration of rigid bodies.	• Independent learning • Interactive learning	•Assignments •Written exams (Quizzes, midterm & final)
3.0	**Values**		
3.1	None		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quiz 1	5	10 %
2	Assignment 1	6	10%
3	Mid-Term LT	8	20 %
4	Quiz 2	12	10 %
5	Assignment 2	13	10%
6	Final Exam-LT	17-19	40 %
7			
8			

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice : • Office hours: 10 hrs/week • After class and outside office hours via e-mails.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Hibbeler R. C. (2014). *Engineering Mechanics*: *Dynamics*. USA: Prentice Hall.
Essential References Materials	Bedford A. and Fowler W (2016). *Engineering Mechanics: Dynamics*. USA: Prentice Hall.
Electronic Materials	Blackboard: https://lms.cisjubail.gov.sa/webapps/login/ https://www.youtube.com/watch?v=Nt1RMdetYlI&index=2&t=0s&list=PLLbvVfERDon1xk3wGaYfXSmGa1u83mGn- https://www.youtube.com/watch?v=m4O3COHsKZs
Other Learning Materials	None

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Lecture rooms with a capacity of at most 25 students and fitted with multimedia projector and a PC.
Technology Resources (AV, data show, Smart Board, software, etc.)	• Smart/White Board and multimedia projector. • Blackboard • Digital tablet and pen
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	None

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment as per QMS-Policy-006 Feedback Survey, QMS-QAP-116 Monitoring Students' Satisfaction	Students	Indirect: Analyzing the results of the following surveys Course Evaluation Survey(CES),

Evaluation Areas/Issues	Evaluators	Evaluation Methods
		Senior Student Experience Survey (SSES)
Quality of Exam papers and Verifying Standards of Student Achievement as per QMS-Policy-004 Policy for Examinations and Marking, QMS-ACP-102 Procedure for Marking Examinations	Examination Committee	Direct: Peer review of examination papers and review or double check a minimum of three or 10% of answer papers. Verifying the entries in the Activity Mark Sheet.
Achievement of learning outcomes as per QMS-Policy-001 Course Review, QMS-CDP-106, QMS-CDP-112 Curriculum Review	Faculty	Direct: Course Report (Section B-3)
Implementation of the action plans based on previous semester as per QMS-Policy-001 Course Review, QMS-CDP-106 Procedure for Course Review, QMS-CDP-112 Procedure for Curriculum Review	Faculty	Direct and Indirect: Course report (Section G-1, G-2)
Monitoring Teaching and Learning as per QMS-Policy-005 Monitoring of Teaching and Learning	Chairperson/Program Director/Course Director	Indirect: Feedback by Chairperson/Program director/Course director. Program Delivery Record.
Effectiveness of planned Teaching Strategies QMS-Policy-001 Course Review	Faculty	Indirect: Course Report (Section B-4)
Course effectiveness and planning for improvement as per QMS-Policy-001 Course Review, QMS-CDP-106 Procedure for Course Review, QMS-CDP-112 Procedure for Curriculum Review	Faculty	Direct and Indirect: Course report (Section G-3)
Verifying Standards of Student Achievement and Quality of Exam papers as per QMS-ACP-119 External Assessment Review	Assessment External Reviewer	Direct: Report of assessment external reviewer. Review of sample of ten or 10% of student's assessments and coursework scripts.

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	
Reference No.	
Date	