AGE-2320
Section 1, CRN: 173/174
Section 2, CRN: 983/984

First Semester 1447 H (Fall 2025) – 2(2,1,0)
"Dynamics"

Course Description

Course-in-brief

Kinematics of a particle: curvilinear motion, and relative motion; Kinematics of a rigid body in plane motion: relative velocity and acceleration, and rotating axes; Kinetics of particles: Newton's law, work and energy, impulse and momentum, and impact; Kinetics of a rigid body in plane motion: translation, fixed axis rotation, general motion, work, and energy, and impulse and momentum.

Level: 5 (for more details: https://appliedengineering.ksu.edu.sa/en/node/2973)

Estimated Category Content:
Engineering science: 2 credit hours

Prerequisite:
AGE-1330 (Statics)

Time and Place

Section 1	Section 2
Lecture (173): **Sun: 01:00 – 02:50 PM** (G-C-124) Dr. El-Sherbeeny	Lecture (983): **Tue: 08:00 – 09:50 AM** (G-D-116) Dr. El-Sherbeeny
Exercises (174): **Tue: 09:00 – 09:50 AM** (1-D-145) Engr. Abdulaziz Alqahtani	Exercises (984): **Wed: 08:00 – 08:50 AM** (G-D-100) Engr. Abdulaziz Alqahtani

Course Resources

Resources for the course include the instructor; assigned textbook and references; class notes and handouts; the library; the World Wide Web.

Instructor
Dr. Ahmed M. El-Sherbeeny
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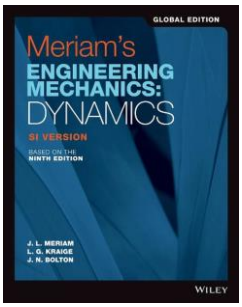
Web Site: https://faculty.ksu.edu.sa/en/aelsherbeeny

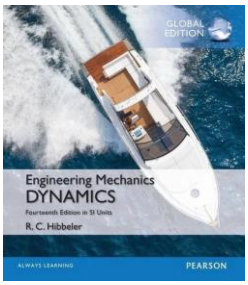
Teaching Assistants
Engr. Abdulaziz Alqahtani

Office Hours
Office hours can be conducted physically, or via Zoom or email. Best times to find me in the office this semester are: **Sun: 03:00 – 05:00 PM; Mon: 03:00 – 05:00 PM, Tue: 10:00 AM – 12:00 PM**; or by appointment.

Textbook: ***Meriam's Engineering Mechanics: Statics***. James L. Meriam, L. G. Kraige, J. N. Bolton. Ninth Edition (SI). Wiley, 2020. ISBN-10: 1119665280, ISBN-13: 9781119665281.



Reference: ***Engineering Mechanics: DYNAMICS***. R. C. Hibbeler. Fourteenth Edition (SI). Pearson, 2016. ISBN-13: 9780134082424.



Course Objectives

This course aims to equip engineering students with fundamental knowledge and analytical skills in the dynamics of particles and rigid bodies. It develops the ability to model and solve problems involving motion, forces, work-energy, and impulse-momentum principles. The course fosters critical thinking, problem-solving, and an engineering mindset for applying dynamics concepts to practical systems and real-world applications.

Intended Learning Outcomes

By the end of this course, students will be able to:

1. Explain the fundamental concepts of particle and rigid body dynamics, including Newton's laws, kinematics, and kinetics.
2. Apply vector methods and coordinate systems (rectilinear, curvilinear, polar, and relative motion) to describe and analyze particle motion.
3. Formulate and solve equations of motion for particles using Newton's second law.
4. Analyze dynamic problems using work–energy principles, including kinetic, potential, and mechanical energy.
5. Apply impulse–momentum relationships to model and solve collision, impact, and conservation of momentum problems.
6. Describe and evaluate the kinematics of rigid bodies in plane motion, including translation, rotation, and general plane motion.
7. Apply equations of motion to rigid bodies under plane kinetics, including translation, rotation about a fixed axis, and general plane motion.
8. Integrate work–energy and impulse–momentum methods into solving engineering problems involving rigid bodies.

Course Policies

Attendance

Attendance is a must! Attendance will be taken at the **first minute** of each class period (lecture, tutorial, and lab). The policy for considering attendance is as follows (please take serious note of this):

- If you are present at the time of taking attendance (in your **official section**) you are considered **present**.
- If you arrive late for your official section, then you are counted as **half-present**, so long as you arrive before mid-session (i.e. within the first 25 minutes); if you arrive later than that, then you are counted as absent.
- If you arrive at the time of taking attendance in a section other than yours, then you are counted as **half-present**; if you arrive later than that, then you are counted as absent.
- If you are absent with a valid excuse, you must bring the original excuse within one week for it to be counted.

Make-up Tests and Late Homework Policy

No makeup test will be given and late homework will not be accepted unless the reason is beyond the student's control. A valid, official excuse must be presented.

Class Discussion

Communication is very important in achieving collective goals and objectives. Feel free to voice your opinions and ask questions anytime during a class period. Practice your right and freedom to learn.

Help Sessions

Help sessions will be organized at convenient times as needed upon request from students.

Assessment and Evaluation

Assessment in the following areas will be converted to points, to compute your final grade in the course:

Assessment Item	Comment	Points*
Attendance	Used only to assess denial status	0%
Quizzes + HW	Assigned frequently (note, quiz problems selected from the HW)	10%
Midterm 1	One midterm (End of 7th Acad. Week): **Midterm: Saturday, Oct. 11, 2025 (19/04/1447H)***	25%
Midterm 2	One midterm (End of 11th Acad. Week): **Midterm: Saturday, Nov. 08, 2025 (17/05/1447H)***	25%
Final Exam	Exams period (Exams Week 2): **Wednesday, Dec. 30, 2025 (26/06/1447H): 1:00 – 4:00 PM**	40%

**** Tentative***

Course Curriculum:

Course topics*:

1. Introduction, Revision and Newton's Laws and Gravitation. (2 Weeks)
2. Kinematics of Particles, Rectilinear Motion, Plane Curvilinear Motion, x-y, t-n and r-θ coordinates and Relative motion. (2 Weeks)
3. Kinetics of Particles, Newton's Second Law, Equation of Motion, work and kinetic energy, impulse and momentum, conservation of momentum. (2 Weeks)
4. Kinematics of Rigid Bodies, Plane Kinematics of Rigid Bodies: Rotation, Relative velocity, acceleration, motion relative to rotating axis. (2 Weeks)
5. Kinetics of Rigid Bodies, Equation of Motion, Plane Kinetics of Rigid Bodies: Translation, Rotation, General Plane Motion (2 Weeks)
6. Work and Energy Methods; impulse and momentum, angular impulse, and momentum. (2 Weeks)

* Subject to change

Selected problems from textbook (4th edition):

Topic	Article	Lecture	Tutorial	Homework	Hours
INTRODUCTION	1/1-7 and Appendix C	1/2, 3			**2**
Newton's Laws	1/3				
Gravitation.	1/5				
KINEMATICS OF PARTICLES					**12**
Rectilinear Motion	2/1,2	2/7, 49	2/45, 46	2/31, 35	
Plane Curvilinear Motion	2/3				
# x-y coordinates	2/4	2/81, 84	2/62, 92	2/80, 88	
# t-n coordinates	2/5	2/99, 119	2/97, 114	2/105, 112	
# r-θ coordinates	2/6	2/135, 140	2/138	2/142, 144	
KINETICS OF PARTICLES					**6**
Newton's Second Law	3/1,2				
Equation of Motion	3/3				
# Rectilinear motion	3/4	3/5, 28	3/7, 12	3/14	
# Curvilinear motion	3/5	3/51, 66	3/77, 81	3/52, 54	
Work and Energy method	3/6,7	3/117, 148	3/110, 128	3/144, 149	
KINEMATICS OF RIGID BODIES					**5**
Rotation	5/1,2	5/2	5/17	5/13	
Relative Velocity	5/4	5/57, 71	5/69	5/75, 79	
Relative Acceleration	5/6	5/124, 136	5/134	5/119, 128	
KINETICS OF RIGID BODIES					**5**
Equations of Motion	6/1,2				
# Translation	6/3	6/1, 26	6/15	6/4, 10	
# Rotation	6/4	6/42	6/40	6/33, 39	
# General Plane Motion	6/5	6/90	S6/95	6/79, 97	