

AGE-2320

Section 1, CRN: 160/215

Section 2, CRN: 173/174

Section 3, CRN: 216/217

Section 4, CRN: 983/984

First Semester 1448 H (Fall 2026) – 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                                                                                  | Section 3                                                | Section 4                                                                          |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|----------------------------------------------------------|------------------------------------------------------------------------------------|
| Lecture (160):<br><b>Sun: 03:00 – 04:50 PM</b><br>(G-D-100)<br>Dr. El-Sherbeeney   | Lecture (173):<br><b>Sun: 01:00 – 02:50 PM</b><br>(G-D-100)<br>Dr. El-Sherbeeney           | Lecture (216):<br>Engr. Mansour –<br>Engr. Abdelaziz     | Lecture (983):<br><b>Tue: 08:00 – 09:50 AM</b><br>(G-D-116)<br>Dr. El-Sherbeeney   |
| Exercises (215):<br><b>Wed: 04:00 – 04:50 PM</b><br>(G-D-101)<br>Dr. El-Sherbeeney | Exercises (174):<br><b>Tue: 09:00 – 09:50 AM</b><br>(1-D-145)<br>Engr. Abdulaziz Alqahtani | Exercises (217):<br>Engr. Mansour –<br>Engr. Abdelaziz i | Exercises (984):<br><b>Wed: 08:00 – 08:50 PM</b><br>(G-D-100)<br>Dr. El-Sherbeeney |

## 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-Sherbeeney

Office: Room S053; email: [aelsherbeeney@ksu.edu.sa](mailto:aelsherbeeney@ksu.edu.sa)

Web Site: <https://faculty.ksu.edu.sa/en/aelsherbeeney>

### 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 **Mon: 12:15 – 01:00 PM; Tue: 12:15 – 01:00 PM**; or by appointment.

### Textbook: Meriam's Engineering

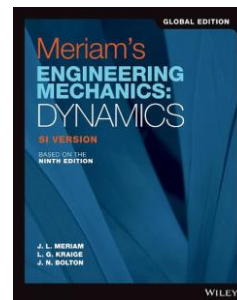
*Mechanics: Dynamics SI Version*. James L.

Meriam, L. G. Kraige, J. N. Bolton. Ninth

Edition (SI). Wiley, 2020. ISBN-10:

1119665280, ISBN-13: 9781119665281 (or

later).

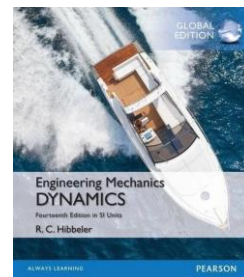


### Reference: Engineering Mechanics:

*DYNAMICS*. R. C. Hibbeler. Fourteenth

Edition (SI). Pearson, 2016. ISBN-13:

9780134082424 (or later).



## 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 principles of particle and rigid-body kinematics and kinetics, including motion descriptions, Newton's laws, work–energy, and impulse–momentum.
2. Apply Newton's second law, work–energy methods, and impulse–momentum principles to analyze the motion of particles and rigid bodies.
3. Construct appropriate free-body and kinetic diagrams, select suitable coordinate systems, and solve engineering dynamics problems using systematic procedures.

## Course Policies

### Attendance

Attendance is a must! Attendance will be taken at the **first minute** of each class period (lecture, tutorial). 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         | Assigned frequently                                                                                        | 10%     |
| Midterm 1       | (~7 <sup>th</sup> Acad. Week) *<br><b>TBA</b>                                                              | 25%     |
| Midterm 2       | ~12 <sup>th</sup> Academic Week*<br><b>TBA</b>                                                             | 25%     |
| Final Exam      | Exams period (Exams Week 2):<br><b>Tuesday, Dec. 22, 2026 (13/07/1448H):</b><br><b>10:30 AM – 12:30 PM</b> | 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- $\theta$  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 (4<sup>th</sup> edition):\*

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

\* *Tentative*