

# MENG233 – Rigid Body Dynamics

Eastern Mediterranean University  
Faculty of Engineering

**Department:**

Mechanical Engineering

**Program Name:**

Mechanical Engineering

**Program Code:** 23

**Course Code:**

MENG233

**Course Title:**

Rigid body dynamics

**Credits:**

4 Cr

**Year/Semester:**

2019-2020 Fall

Area Core

Area Elective

Service Course

University Elective

Compulsory (offered by other academic units)

**Prerequisite(s):** MENG231 or CIVL211

**Catalog Description:**

Kinematics of rigid bodies. 2-D rigid body dynamics, D`Alembert`s principle. Energy Methods. Principle of impulse and momentum Angular momentum in 3-D Motion about a fixed axis. Un-damped vibration of rigid bodies.

**Instructor Name:**

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**Course Web Page:**

<https://staff.emu.edu.tr/qasimzeeshan/en>

**Textbook(s):**

- R. C. Hibbeler, Engineering Mechanics – Dynamics, 13<sup>th</sup> Edition.
- Ferdinand P. Beer E. Russel Johnston, Jr. and Phillip J. Cornwell, Vector Mechanics for Engineers - Dynamics, 9<sup>th</sup> Edition in SI units, Mc Graw Hill.

**Indicative Basic Reading List :****Topics Covered and Class Schedule:**

(4 hours of lectures, 1 hour of tutorial and 1 hour of lab work per week)

Weeks 1-4 Kinematics of particles

Week 5 Kinetics of particles (Force and Acceleration)

Week 6 Kinetics of particles (Work and Energy)

Weeks 7 Kinetics of particles (Impulse and Momentum)

Weeks 8-9 **Midterm Examination**

Week 10 Plane Kinematics of Rigid Bodies

Week 11 Plane Kinetics of Rigid Bodies (Force and Acceleration)

Week 12 Plane Kinetics of Rigid Bodies (Work and Energy)

Week 13 Plane Kinetics of Rigid Bodies (Impulse and Momentum)

Week 14 Vibrations

Week 15 **Final Examination**

Lecture and Tutorial Learning Outcome	Student Outcomes	Performed Assessments and Percentage
<ul style="list-style-type: none"> <li>Understand the principles of Newton's laws and their application to the real life physical problems that require knowledge of the relationship between force and motion.</li> <li>Ability to draw free body diagrams</li> <li>Understand and use the vector concepts to describe the motion of particles and rigid bodies</li> <li>Understand the concepts of kinetic, potential and mechanical energies.</li> <li>Understand the concepts of work, energy, power and mechanical efficiency</li> <li>Develop the analytical skills needed to systematically formulate, solve, and analyze a wide range of dynamics problems.</li> <li>Develop equations of motion for simple systems of particles and rigid bodies</li> <li>Model dynamics problems consisting of mechanical systems composed of rigid components.</li> </ul>	<b>1</b>	Quiz 1: 5% Midterm Exam: 30% Quiz 2: 5% Final Examination: 40% Project: 10%

Lab. Experiment Title and Lab. Equipment Used	Lab Learning Outcome	Student Outcomes	Performed Assessments and Percentage
<ul style="list-style-type: none"> <li>Conservation of Momentum</li> <li>Measurement of Static and Kinetic Coefficients of Friction</li> </ul>	1. Develop equations of motion for simple systems of particles and rigid bodies	<b>6</b>	Lab Works and Lab Attendance 10%

### Student Outcomes

<input checked="" type="checkbox"/>	1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
<input type="checkbox"/>	2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
<input type="checkbox"/>	3. an ability to communicate effectively with a range of audiences
<input type="checkbox"/>	4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
<input type="checkbox"/>	5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
<input checked="" type="checkbox"/>	6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
<input type="checkbox"/>	7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

### Contribution of Course to Criterion 5

Credit Hours for:

Mathematics & Basic Science : 0

Engineering Sciences and Design : 6

General Education : 0

## Important Notes:

University rules and regulations are applied to this course. For details, please see <http://mevzuat.emu.edu.tr>

1. **“NG” Nil Grade/ Failing from Absenteeism:** Students who do not comply with the required level attendance and/or not fulfilling the requirements for the evaluation of the course are given the “NG” grade by the Instructor of the Course based on the criteria determined by the Faculty/School Academic Council. Students are informed about the criteria for receiving the “NG” grade by the related course instructor at the beginning of the semester. “NG” grade is included in the computation of GPA and CGPA.
2. Student attendance is monitored and assessed by the course instructor. A student who fails to meet the requirements of a course or who is absent more than the limit specified by the Faculty or School is considered to be unsuccessful in that course.
3. Students who do not attend any of the above assessment activities (such as mid-term exam, lab exam, homework, design project report etc.) will be given NG (Nil Grade).
4. Late Submissions of the Assignments, Lab Reports and Project will be graded as zero.

## MAKE-UP EXAM:

1. There is no make-up or resit for the Quiz and Labs.
2. A student who fails to sit for an examination for a valid reason is given a make-up exam. Within three working days after the examination, students who wish to take a make-up must submit a **written statement** to the course instructor explaining the reason(s) for his/her request.
3. Eligibility to take a **Make-Up Exam**:
  - a. Student must contact the Instructor immediately within “**three working days**” after the examination when (s)he has missed the mid-term exam or final exam and to discuss with the faculty about the date and time to take the make-up exam.
  - b. Student must secure a “**Make-Up Exam Form**” from the department Office or from instructor website & fill-out the Form. For each Make-Up Exam, please use separate Form.
  - c. Student must secure the approval from the instructor for taking the Make-Up Exam.
  - d. Failure to take the Make-Up Exam at the agreed date and time will lead to a “NG” Grade for the Make-Up Exam, midterm or final.