Module (Course Syllabus) Catalogue

2023-2024

College/ Institute	Erbil Technical Engineering College	
Department	Technical Mechanical and Energy Engineering	
Module Name	Engineering Mechanics- Dynamics	
Module Code	EMD303	
Degree	Technical Diploma ☐ Bachler ■ High Diploma ☐ Master ☐ PhD ☐	
Semester	Third	
Qualification	MSc	
Scientific Title	Lecturer	
ECTS (Credits)	5	
Module type	Prerequisite ☐ Core ■ Assist. ☐	
Weekly hours	3hrs	
Weekly hours (Theory)	(3)hrs Class	(40)Total hrs Workload
Weekly hours (Practical)	(0)hr Class	(0)Total hrs Workload
Number of Weeks	12 weeks	
Lecturer (Theory)	Ava Ali Kamal Mohammed	
E-Mail & Mobile NO.	ava.mohammed@epu.edu.iq	
Lecturer (Practical)	-	
E-Mail & Mobile NO.	-	
Websites	-	

Course Book

Course Description	**This course teaches students how to apply Newtonian physics to analyse relatively simple physical mechanisms, with some emphasis on commonly encountered engineering applications. It deals with dynamics of particles and rigid bodies, applications of free-body diagrams, Newton's law, mechanical vibrations, the impulse-momentum method and the work-energy principle to solve dynamic problems in mechanical systems.** **It is very important to emphasize that this is a problem-oriented class and the only way that the material can be mastered is with practice solving problems in addition to homework problems.** **Prerequisites: Engineering Mechanics-Statics**
Course objectives	**At the end of this course the student will be able to:** **1. Introduce students to the concepts of dynamics. The students are expected to develop working skills in the dynamic analysis of both particles and rigid bodies.** **2. To introduce the physical principles to the analysis of particle and rigid-body motion problems.** **3. Master the basics of dynamics, including free body diagrams and kinematics, and broadens those basics through the extensive use of vector math to 3-D problems.** **4. Learn the mathematical formulations of dynamics problems.** **5. Obtain an understanding of Newtons Laws of Motion, and the ability to apply energy and momentum methods to particles and rigid bodies in planar motion.**

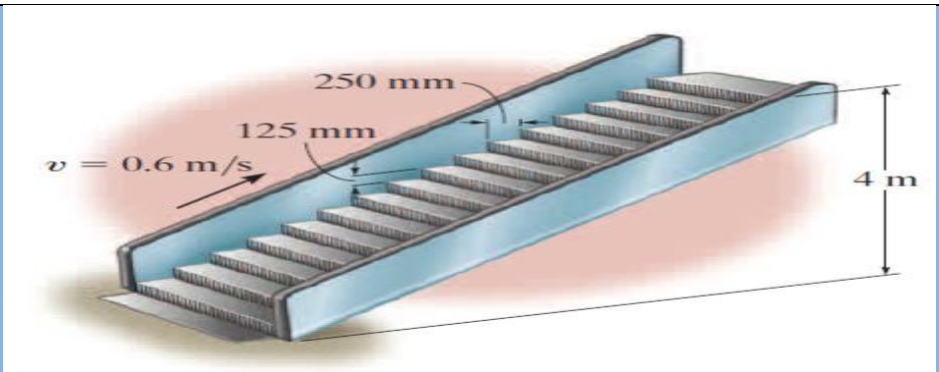
<table>
<tr><td>Student's obligation</td><td colspan="5">1. Homework will be assigned periodically.
2. Students are responsible to do homework on their own.
3. There will be several quizzes during the academic year, not necessarily announced. The quiz contains the materials covered in previous lectures, homework or to be covered that day.
4. Any quiz or test missed without a supported documented and excused absence will represent a zero.
5. Attendance and participation in the lecture are mandatory and will be considered in the grading.
Students should bring calculators, rulers, pen and pencils to be used during the lectures.</td></tr>
<tr><td>Required Learning Materials</td><td colspan="5">Data show and white board are used throughout the lectures and the lecture notes will be uploaded to the Moodle platform before the lecture day.</td></tr>
<tr><td rowspan="11">Evaluation</td><td colspan="2">Task</td><td>Weight (Marks)</td><td>Due Week</td><td>Relevant Learning Outcome</td></tr>
<tr><td colspan="2">Paper Review</td><td></td><td></td><td></td></tr>
<tr><td rowspan="6">Assignments</td><td>Homework</td><td>14%</td><td></td><td></td></tr>
<tr><td>Class Activity</td><td></td><td></td><td></td></tr>
<tr><td>Report</td><td>24%</td><td></td><td></td></tr>
<tr><td>Seminar</td><td></td><td></td><td></td></tr>
<tr><td>Essay</td><td></td><td></td><td></td></tr>
<tr><td>Project</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Quiz</td><td>6%</td><td></td><td></td></tr>
<tr><td colspan="2">Lab.</td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Midterm Exam</td><td>16%</td><td></td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>40%</td><td></td><td></td></tr>
<tr><td colspan="2">Total</td><td>100%</td><td></td><td></td></tr>
<tr><td>Specific learning outcome:</td><td colspan="5">Students who successfully complete the course should demonstrate the following outcomes by tests and homework:
1. A knowledge of kinematic and kinetic analyses for particles and systems of particles.
2. A knowledge of momentum and energy methods for particles and systems of particles.
3. A knowledge of kinematic and kinetic analyses for rigid bodies.
4. A knowledge of momentum and energy methods for rigid bodies.</td></tr>
</table>

Course References:	Engineering Mechanics/Dynamics, R.C. HIBBELER, (2016) 14th edition.

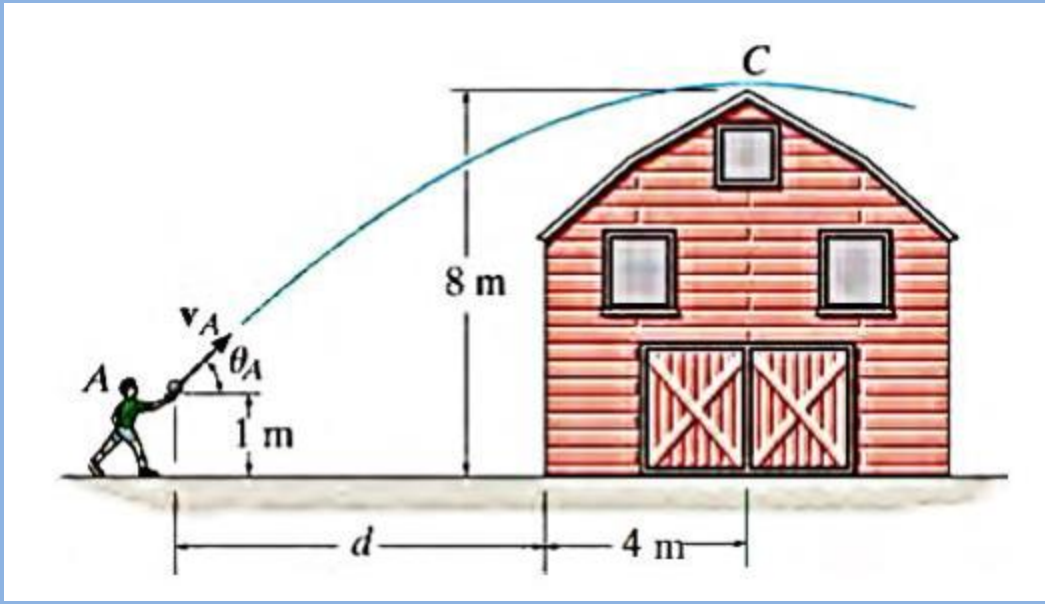
Course topics (Theory)	Week	Learning Outcome
Kinematics of a Particles, Rectilinear Motion of particles.	1	
Rectilinear Kinematics: Erratic Motion.	2	
General Curvilinear Motion, Curvilinear Motion: Rectangular Components, Motion of a Projectile.	3	
Curvilinear Motion: Normal and Tangential Components	4	
Curvilinear Motion: Cylindrical Components (Radial and Transverse Components), Cylindrical Coordinates	5	
Kinetics of a particle (Force and acceleration), Newton's Laws of Motion, The Equation of Motion	6	
Equations of motion: normal and tangential coordinates.	7	
Equations of motion: cylindrical coordinates.	8	
Work and energy	9	
Conservative forces and potential energy	10	
Impulse and momentum	11	
Conservative of linear momentum for a system of particles	12	

Questions Example Design

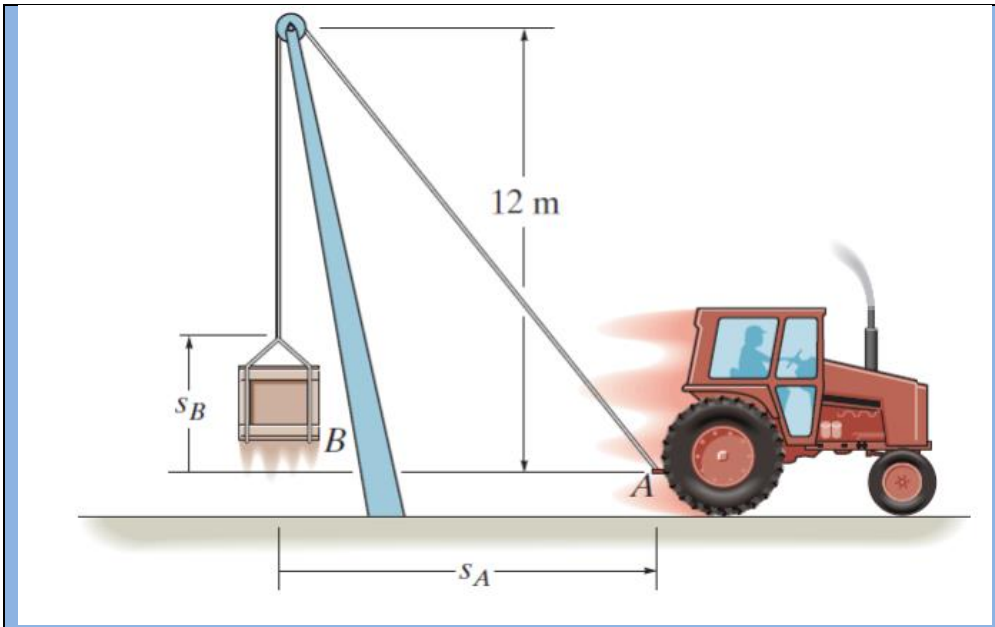
Q1: The escalator steps move with a constant speed of 0.6 m/s. If the steps are 125 mm high and 250 mm in length, determine the power of a motor needed to lift an average mass of 150 kg per step. There are 32 steps. (25 marks)



Q2: The boy at A attempts to throw a ball over the roof of a barn with an initial speed of vA = 15 m/s). Determine the angle θA at which the ball must be thrown so that it reaches its maximum height at C. Also, find the distance d where the boy should stand to make the throw. (25 marks)



Q3: The tractor is used to lift 150 kg load B with 24 m long rope, boom, and pulley system. If the tractor travels to the right with an acceleration of a = 3 $m/s2$ and has a velocity of v = 4 m/s at the instant SA = 5 m, determine the tension in the rope at this instant. When SA = 0, SB = 0.
(20 marks)



External Evaluator

I confirm that this course book is satisfy and covers all the requirement of the Engineering Dynamics Module.

Dr. Zhwan Dilshad Ibrahim