Module (Course Syllabus) Catalogue

2022-2023

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	**PhD**	
Scientific Title	**Lecturer**	
ECTS (Credits)	**5**	
Module type	**Prerequisite** ☐ **Core** ■ **Assist.** ☐	
Weekly hours	**3 hrs**	
Weekly hours (Theory)	**(3) hr Class**	**(40)Total hrs Workload**
Weekly hours (Practical)	**(0)hr Class**	**(0)Total hrs Workload**
Number of Weeks	**12 weeks**	
Lecturer (Theory)	**Dr. Zhwan Dilshad**	
E-Mail & Mobile NO.	**zhwan.ibrahim@epu.edu.iq**	
Lecturer (Practical)	**NA**	
E-Mail & Mobile NO.	**NA**	
Websites	**NA**	

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. Exposure to simple vibration.
Student's obligation	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

<table>
<tr><td></td><td>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>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>Evaluation</td><td>
<table>
<tr><th colspan="2">Task</th><th>Weight (Marks)</th><th>Due Week</th><th>Relevant Learning Outcome</th></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>
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<tr><td>Specific learning outcome:</td><td>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.</td></tr>
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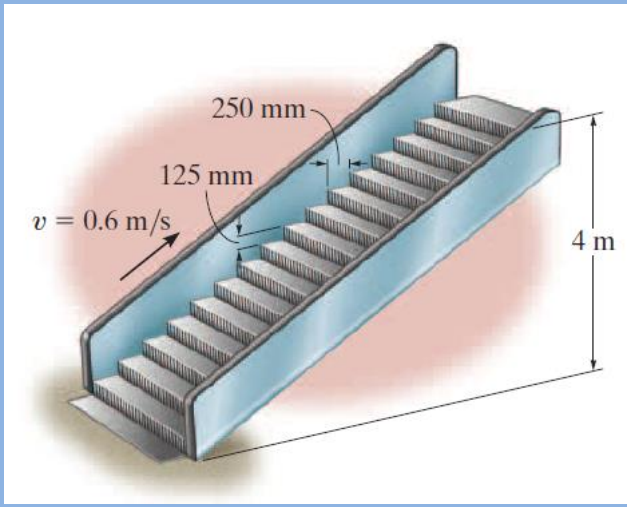
	4. A knowledge of momentum and energy methods for rigid bodies. A basic understanding of vibrations in one degree of freedom systems.
Course References:	1. Course notes 2. Engineering Mechanics/Dynamics, R.C. HIBBELER, (2007) 11th edition. 3. Vector Mechanics for Engineers Dynamics, Ferdinand P. Beer, E. Russell Johnston (2004) 7th edition.

Course topics (Theory)	**Week**	**Learning Outcome**
Introduction to Engineering Dynamics, General Principles	1	
Kinematics of a Particles, Rectilinear Motion of particles	2	
Rectilinear Kinematics: Erratic Motion	3	
General Curvilinear Motion, Curvilinear Motion: Rectangular Components	4	
Motion of a Projectile	5	
Curvilinear Motion: Normal and Tangential Components	6	
Curvilinear Motion: Cylindrical Components (Radial and Transverse Components), Cylindrical Coordinates	7	
Absolute Dependent Motion Analysis of Two Particles	8	
Kinetics of a particle (Force and acceleration), Newton's Laws of Motion, The Equation of Motion	9	
Equation of Motion for a System of Particles	10	
Equation of Motion: Rectangular Components	11	
Equation of Motion: Normal and Tangential Components	12	
Equation of Motion: Cylindrical Coordinates	13	
Power and Efficiency and Conservative Forces and Potential Energy, Conservation of Energy	14	
Practical Topics	**Week**	**Learning**

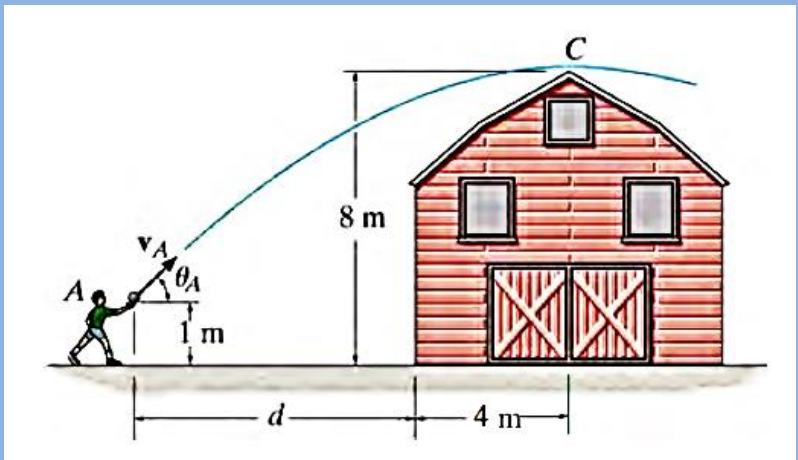
		Outcome

Questions Example Design

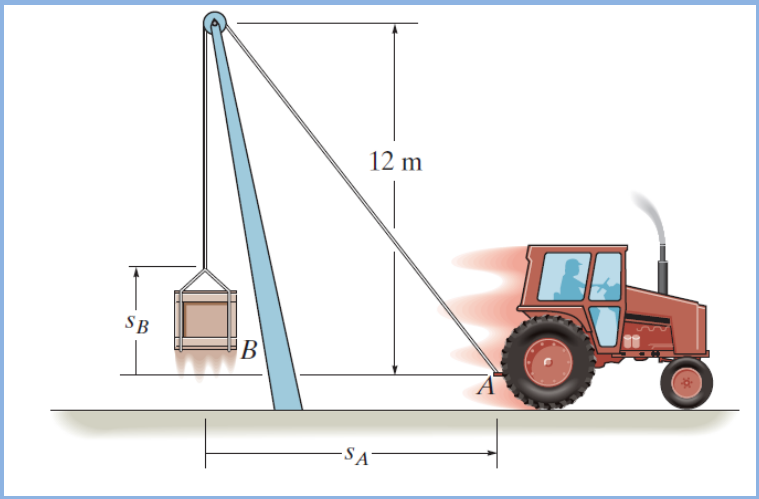
Q¹: The escalator steps move with a constant speed of 0.6 m/s. If the steps are 125 *mm* high and 250 *mm* in length, determine the power of a motor needed to lift an average mass of 150 *kg* per step. There are 32 steps. ***(25 marks)***



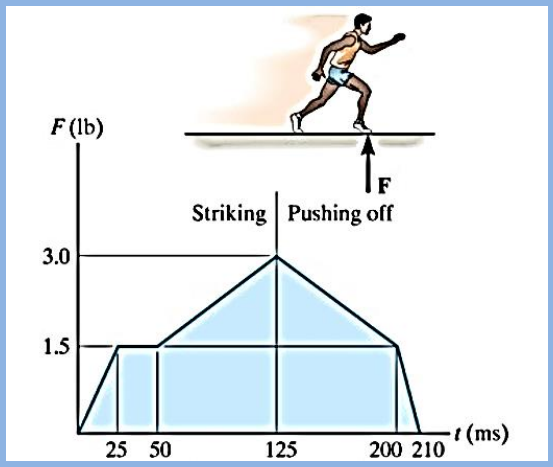
Q²: The boy at *A* attempts to throw a ball over the roof of a barn with an initial speed of $v_A = 15\ m/s$). Determine the angle θ_A at which the ball must be thrown so that it reaches its maximum height at *C*. Also, find the distance *d* where the boy should stand to make the throw. ***(25 marks)***



Q^3: 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 $a = 3\ m/s^2$ and has a velocity of $v = 4\ m/s$ at the instant $S_A = 5\ m$, determine the tension in the rope at this instant. When $S_A = 0$, $S_B = 0$. ***(20 marks)***



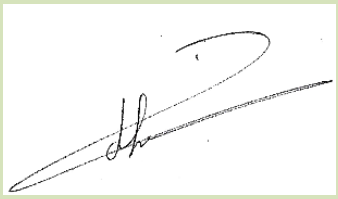
Q^4: From experiments, the time variation of the vertical force on a runner's foot as he strikes and pushes off the ground is shown in the graph. These results are reported for a 1 *lb static* load, i.e., in terms of unit weight. If a runner has weight *175 Ib*, determine the approximate vertical impulse he exerts on the ground if the impulse occurs in 210 *ms*. ***(20 marks)***



Extra notes:

External Evaluator

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



Dr. Dlair O. Ramadan