

## COURSE SYLLABUS

### 1. General Information:

Alpha-numeric codification: INGE 3035

Course Title: Engineering Mechanics

Number of credits: 3

Contact Period: 3 contact hours of Conference a week

### 2. Course Description:

English: Analysis of force systems; the laws of equilibrium, friction; centroids and moments of inertia. Kinematics and dynamics of particles and rigid bodies.

Spanish: Análisis de sistemas de fuerzas, la leyes de equilibrio, razonamiento, centroide y momento de inercia cinemática y dinámica de partículas y cuerpos rígidos.

### 3. Pre/Co-requisites and other requirements:

MATE 3031 or MATE 3144 or MATE 3183 / Co-requisite: FISI 3161 or FISI 3171

### 4. Course Objectives:

Upon successful completion of this course the student shall be able to:

- Describe position, forces, and moments in terms of vector forms in two and three dimensions.
- Determine rectangular and nonrectangular components of a force.
- Determine the resultant of a force system including distributed forces.
- Simplify systems of forces and moments to equivalent systems.
- Draw free body and kinetic diagrams for particles and rigid bodies.
- Compute support reactions on a structure.
- Analyze systems that include frictional forces.
- Calculate centers of gravity and centroids.
- Determine the kinematics relationships between position, velocity, and acceleration for two-dimensional motion of systems of particles and rigid bodies.
- Calculate the velocity and acceleration of a particle in rectangular and normal/tangential coordinate systems.
- Relate the velocity and acceleration of points in a rigid body using the relative motion approach.
- Determine the mass moments of inertia of rigid bodies.
- Apply Newton's second law in two dimensions.
- Analyze the two dimensional motion of particles and rigid bodies using the work and energy principle.

The objectives of the course will be assessed using exams, quizzes and short assignments. Other assessment tools such as special reports and projects could be used at the professor's discretion.

**5. Instructional Strategies:**

- Conference       Discussion       Computation       Laboratory  
 Seminar with formal presentation       Seminar without formal presentation  
 Workshop       Art workshop       Practice       Trip  
 Thesis       Special problems       Tutoring       Research  
 Other, please specify:

**6. Minimum or Required Resources Available:**

Textbook. For online lectures a laptop with camera and access to High Speed Internet are needed.

**7. Course time frame and thematic outline:**

<b>Outline of Topics</b>	<b>Contact Hours</b>
<b>STATICS</b>	
<b>General Principles</b>	1
<b>Equilibrium of Particles</b>	
• Forces and their characteristics	1
• Resultant of Concurrent Forces	2
• Resolution of a Force into Components	1.5
• Equations of Equilibrium	1.5
• Free Body Diagram	2
<b>Equivalent Force and Moment Systems</b>	
• Moments and Couples	2
• Resolution of a Force into a Force and a Couple	1
• Simplification of a Force System	1
<b>Distributed Forces, Centroids and Center of Gravity</b>	
• Center of Mass and Center of Gravity	1
• Centroids of Volumes, Areas and Lines	1
• Centroids of Composite Bodies	1
• Distributed Loads on Beams	1
<b>Equilibrium of Rigid Bodies</b>	
• Free Body Diagrams	1
• Equilibrium in Two Dimensions (2D)	2
<b>Total hours - Statics</b>	<b>20</b>

## 7. Course time frame and thematic outline (continued):

Outline of Topics	Contact Hours
<b>DYNAMICS</b>	
<b>Kinematics of Particles</b>	
• Position, Velocity, and Acceleration	2
• Rectilinear and Curvilinear Motion	2
• Relative Motion	1
<b>Kinetics of Particles: Newton's Laws</b>	
• Equation of Motion	3
<b>Kinetics of Particles: Work and Energy Methods</b>	
• Work a Force	1
• Principle of Work and Energy	2
<b>Kinematics of Rigid Bodies</b>	
• Translation	1
• Rotation about a Fixed Axis	1
• General Plane Motion	2
<b>Kinetics of Rigid Bodies:: Newton's laws</b>	
• Equations for Plane Motions	2
• Moments of Inertia	1
• Translation, Rotation and General Plane	2
<b>Kinetics of Rigid Bodies: Work and Energy Methods</b>	
• Work of Forces and Couples Acting on Rigid Bodies	2
• Kinetic Energy of Rigid Bodies in Plane Motion	2
• Principle of Work and Energy	1
<b>Total hours – Dynamics</b>	<b>25</b>
<b>Total hours: (equivalent to contact period)</b>	<b>45</b>

## 8. Grading System:

Quantifiable (letters)       Not Quantifiable

## 9. Evaluation Strategies:

THEORY	Quantity	Percent
<input checked="" type="checkbox"/> Exams	2 to 4	40 to 80
<input checked="" type="checkbox"/> Final Exam	1	20 to 40
<input checked="" type="checkbox"/> Quizzes	Variable	0 to 20
<input checked="" type="checkbox"/> Homework	Variable	0 to 20
<input checked="" type="checkbox"/> Oral Reports	Variable	0 to 10
<input checked="" type="checkbox"/> Written Reports	Variable	0 to 10
<input checked="" type="checkbox"/> Portfolio	Variable	0 to 10
<input checked="" type="checkbox"/> Projects	Variable	0 to 10
<input type="checkbox"/> Journals		
<input checked="" type="checkbox"/> Other, specify: Participation	Variable	0 to 10
<b>TOTAL:</b>		<b>100%</b>

## **10. Bibliography:**

### **Textbook:**

- Engineering Mechanics: Dynamics, R. C. Hibbeler, 13<sup>th</sup> Ed. Prentice Hall, 2013.

### **References:**

- Vector Mechanics for Engineers, F. P. Beer, E.R. Johnston, and W. E. Clausen 8th Edition, McGraw-Hill, 2007.
- Engineering Mechanics (Dynamics), Pytel Andrew, Kiusalaas Jaan. NY, 2<sup>nd</sup> Edition, NY: Harper Collins 1998.

## **11. Reasonable Accommodation (Law 51):**

The University of Puerto Rico at Mayagüez (RUM) recognizes that each student has an inherited right to request reasonable accommodation according to Law 51: Law for Integral Educational Services for People with Disabilities. Every student has the right to receive reasonable accommodation if he/she presents the necessary evidence to be evaluated by the Office of Services to Students with Disabilities (OSEI-RUM), and the related information can be found at the following link: <https://www.uprm.edu/cms/index.php/page/85>. If your case is approved by OSEI-RUM, you will receive reasonable accommodation in your courses and evaluation, and you must contact each professor for course registered. For additional information contact OSEI-RUM at Sánchez Hidalgo 410 or via telephone 787-832-4040 extension 3107.

## **12. Academic Integrity:**

The University of Puerto Rico promotes the highest standards of academic and scientific integrity. Article 6.2 of the UPR Students General Bylaws (Board of Trustees Certification 13, 2009-2010) states that academic dishonesty includes, but is not limited to: fraudulent actions; obtaining grades or academic degrees by false or fraudulent simulations; copying the whole or part of the academic work of another person; plagiarizing totally or partially the work of another person; copying all or part of another person answers to the questions of an oral or written exam by taking or getting someone else to take the exam on his/her behalf; as well as enabling and facilitating another person to perform the aforementioned behavior. Any of these behaviors will be subject to disciplinary action in accordance with the disciplinary procedure laid down in the UPR Students General Bylaws.—

## **13. Policy Against Discrimination Based on Sex, Sexual Orientation, and Gender Identity:**

The University of Puerto Rico prohibits discrimination based on sex, sexual orientation, and gender identity in any of its forms, including that of sexual harassment. According to the Institutional Policy Against Sexual Harassment at the University of Puerto Rico, Certification Num. 130, 2014-2015 from the Board of Governors, any student subjected to acts constituting sexual harassment, may turn to the Office of the Student Ombudsperson, the Office of the Dean of Students, and/or the Coordinator of the Office of Compliance with Title IX for an orientation and/or formal complaint.

## **14. Sexual Harassment: Certification 130-2014-2015 states:**

Sexual harassment in the workplace and in the study environment is an illegal and discriminatory act and is against the best interests of the University of Puerto Rico. All persons who understand they have been subject to acts of sexual harassment at the University of Puerto Rico may file a complaint and request that the institution investigate, where necessary, and assume the corresponding action by the university authorities. If the complainant is a student, he or she must refer his or her complaint to the Office of the Student Ombudsperson or that of the Dean of Students.

**15. Certification 06-43 of the Academic Senate states, "The academic guidelines for offering online courses," defines:**

Traditional face-to-face courses are those that have less than 25% of the course's regular contact hours via the Internet. Therefore, a three-credit course will be considered "face to face" if, of the 45 hours of regular contact, 11 or less are taught via the Internet. According to certification 16-43 of the Academic Senate, a course may include up to 25% of its total contact hours via the Internet. The objective of this is so that all professors have this alternative in the case of any unscheduled eventuality.

Revised by:



Iván Baigés Valentín, PhD  
Coordinator, Applied Mechanics Committee

Approved by:



Aidsa I. Santiago Román, PhD  
Department Chair

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