University of Puerto Rico
Mayagüez Campus
College of Engineering
Department of Engineering Sciences and Materials

COURSE SYLLABUS

1. General Information:

Alpha-numeric codification: INGE 3032
Course Title: Engineering Mechanics: Dynamics
Number of credits: 3
Contact Period: 3 contact hours of Conference a week

2. Course Description:

English: Kinematics of particles and rigid bodies; relations among force, mass and acceleration; kinetics of particles and rigid bodies; work and energy; impulse and momentum.

Spanish: Cinemática de la partícula y de cuerpos rígidos, relaciones de fuerza, masa y aceleración. Cinética de la partícula y de cuerpo rígido. Trabajo y energía, impulso y momentum.

3. Pre/Co-requisites and other requirements:

INGE 3031 and (FISI 3161 or FISI 3171)

4. Course Objectives:

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

- Determine the kinematic 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, polar and normal/tangential coordinate systems.
- Relate the velocity and acceleration of points in a rigid body using the absolute and relative motion approaches.
- Determine the mass moments of inertia of rigid bodies.
- Draw free body and kinetic diagrams for particles and rigid bodies.
- Apply Newton's second law in two dimensions.
- Analyze the two dimensional motion of particles and rigid bodies using: principle of work and energy; impulse and momentum, both linear and angular.

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:

Outline of Topics	Hours
Kinematics of Particles	
• Position, Velocity and Acceleration	2
• Rectilinear Motion	3
• Curvilinear Motion	4
• Relative Motion	1
Kinetics of Particles: Newton's Laws	
• Equations of Motion for a Single Particle and a System of Particles	1
• Rectilinear Motion	1
• Curvilinear Motion	2
Work and Energy Method for Particles	
• Principle of Work and Energy	2
• Power and Efficiency	1
• Conservation of Energy	1
Impulse and Momentum for Particles	
• Principle of Impulse and Momentum Impact	4
Kinematics of Rigid Bodies	
• Translation and Rotation	2
• General Plane Motion	4
Kinetics of Rigid Bodies	
• Moment of Inertia	1
• Equations of Motion	1
• Translation and Rotation	2
• General Plane Motion	2
Work and Energy Methods for Rigid Bodies in Plane Motion	4
Impulse and Momentum of Rigid Bodies	4
Exams	3
Total hours: (equivalent to contact period)	**45**

8. Grading System:

☒ Quantifiable (letters) ☐ Not Quantifiable

9. Evaluation Strategies:

THEORY	Quantity	Percent
☒ **Exams**	2 to 4	40 to 80
☒ **Final Exam**	1	20 to 40
☒ **Quizzes**	Variable	0 to 20
☒ **Homework**	Variable	0 to 20
☒ **Oral Reports**	Variable	0 to 10
☒ **Written Reports**	Variable	0 to 10
☒ **Portfolio**	Variable	0 to 10
☒ **Projects**	Variable	0 to 10
☐ **Journals**		
☒ **Other, specify: Participation**	Variable	0 to 10
TOTAL:		**100%**

10. Bibliography:

Textbook:

- Engineering Mechanics: Dynamics, R. C. Hibbeler, 13th 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, 2nd 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:

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Approved by:

Aidsa I. Santiago Román, PhD
Department Chair

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