

COURSE SYLLABUS

1. General Information:

Alpha-numeric codification: INGE/INME 4046
 Course Title: Fundamentals of Vibration
 Number of credits: 3
 Contact Period: 3 hours of lecture per week

2. Course Description:

English: Study of the theory of vibration for single- and two-degree - of freedom systems. Free vibration analysis, response to harmonic and non-harmonic excitations, design for vibration control, and introduction to matrix analysis of multi-degree-of-freedom systems.

Spanish: Estudio de la teoría de vibraciones de sistemas de uno y dos grados de libertad. Análisis de vibraciones libres, respuesta debido a excitaciones armónicas y no-armónicas, diseño para el control de vibraciones e introducción al análisis matricial de sistemas de múltiples grados de libertad.

3. Pre/Co-requisites and other requirements:

Pre-requisites: INGE 3032 / Co-requisites: MATE 4009

4. Course Objectives:

After successful completion, students are expected to be proficient in the following areas:

- Mathematical modeling of linear components for dynamic systems.
- Free vibration analysis for undamped and damped single- and two-degree-of-freedom systems.
- Harmonic response analysis for undamped and damped single- and two-degree-of-freedom systems.
- Forced vibration analysis of undamped and damped single- and two-degree-of-freedom systems.
- Forced vibration analysis for multi-degree-of-freedom systems.
- Design consideration and vibration control.
- 7. Principles of active vibration controls.

5. Instructional Strategies:

- | | | | |
|---|--|--|-------------------------------------|
| <input checked="" type="checkbox"/> Conference | <input checked="" type="checkbox"/> Discussion | <input type="checkbox"/> Computation | <input type="checkbox"/> Laboratory |
| <input type="checkbox"/> Seminar with formal presentation | | <input type="checkbox"/> Seminar without formal presentation | |
| <input type="checkbox"/> Workshop | <input type="checkbox"/> Art workshop | <input type="checkbox"/> Practice | <input type="checkbox"/> Trip |
| <input type="checkbox"/> Thesis | <input type="checkbox"/> Special problems | <input type="checkbox"/> Tutoring | <input type="checkbox"/> Research |
| <input type="checkbox"/> Other, please specify: | | | |

6. Minimum or Required Resources Available:

Textbook.

7. Course time frame and thematic outline:

| Outline of Topics | Contact Hours |
|---|----------------------|
| • Kinematics of Particles | 1 |
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| • Kinematics of Rigid Bodies | 1 |
| • Li Kinetics of Rigid Bodies | 1 |
| • General Concepts of Vibration | 2 |
| • Equation of Motion: Newton's Second Law | 5 |
| • Free Vibration: Undamped SDOF System | 4 |
| • Harmonic Excitation: Undamped SDOF System | 4 |
| • Arbitrary Loads: Undamped SDOF System | 4 |
| • Free Vibration: Damped SDOF System | 3 |
| • Harmonic Excitation: Damped SDOF System | 3 |
| • Arbitrary Loads: Damped SDOF System | 3 |
| • Numerical Evaluation: Response to Arbitrary Loads | 5 |
| • Vibrations: MDOF System (Matrix Analysis) | 3 |
| • Vibrations Control Design | 3 |
| • Introduction: Lagrange's Equations of Motion | 2 |
| Total hours: (equivalent to contact period) | 45 |

8. Grading System:
 Quantifiable (letters) Not Quantifiable
9. Evaluation Strategies:

| | Quantity | Percent |
|---|-----------------|----------------|
| <input checked="" type="checkbox"/> Exams | 2 | 50 |
| <input checked="" type="checkbox"/> Final Exam | 1 | 25 |
| <input type="checkbox"/> Short Quizzes | | |
| <input type="checkbox"/> Oral Reports | | |
| <input type="checkbox"/> Monographies | | |
| <input type="checkbox"/> Portfolio | | |
| <input checked="" type="checkbox"/> Projects | 1 | 25 |
| <input type="checkbox"/> Journals | | |
| <input type="checkbox"/> Other, specify: | | |
| TOTAL: | | 100% |

10. Bibliography:

Textbook:

- Engineering Vibration, Daniel J. Inman, 4th Ed. 2013, PEARSON – Prentice Hall.

References:

- Piersol, A. G. and Paez, T. L., “Harris’ Shock and Vibration Handbook,” 6th Ed., McGraw Hill, 2010.
- Meirovitch, L., “Fundamentals of Vibration”, Waveland Press, Inc., 2010.
- Rao, S. S., “Mechanical Vibrations,” 5th Ed., Prentice Hall, 2010.
- Schmitz, T. L. and Smith, K.S., “Mechanical Vibrations – Modeling and Measurement,” Springer, ISBN: 978-1-4614-0460-6 (Online), 2012.

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:

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Department Chair

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