



University of Puerto Rico
 Mayagüez Campus
 College of Engineering
 Department of Mechanical Engineering
 Bachelor of Science in Mechanical Engineering



Course Syllabus

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| 1. General Information: | |
| Alpha-numeric codification: INME 5025 Course Title: Metals Fatigue (II) Number of credits: 3 Contact Period: Three hours of lecture per week | |
| 2. Course Description: | |
| English: Nature of metal fatigue; modern approaches to design of mechanical components for repeated loadings; importance of residual stresses and stress concentrations; analysis of cumulative damage and life prediction; cycle counting and sequence of events. | |
| Spanish: Naturaleza de la fatiga en los metales; métodos modernos de diseño de elementos mecánicos sometidos a cargas variables; importancia de los esfuerzos residuales y concentradores de esfuerzos; análisis de daño acumulado y predicción de vida útil; determinación de ciclos de trabajo y secuencia de eventos. | |
| 3. Pre/Co-requisites and other requirements: | |
| Prerequisites: INME 4007 or INME 4107 or Authorization of the Director of the Department | |
| 4. Course Objectives: | |
| <ul style="list-style-type: none"> ● Recognizing fatigue and mechanical damage and know how to diagnose and avoid them ● Explaining the mechanical behavior of materials subjected to repeating loading ● Describing the type of mechanical damage ● Describing the type fracture: Brittle, ductile or mixed fracture ● Describing the effect of low cycle and high cycle fatigue | |
| 5. Instructional Strategies: | |
| <input checked="" type="checkbox"/> conference <input 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: | |
| None | |
| 7. Course time frame and thematic outline | |
| General Topics | Contact Hours |
| Historical overview. | 1 |
| Fatigue design methods, and macro/micro aspects of fatigue of metals. | 3 |
| Fundamentals of LEFM for application to fatigue crack growth and fracture. | 5 |

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| Constant amplitude fatigue tests and data. | 6 |
| Notches and their effects, and self-stresses and notch strain analysis. | 5 |
| Life estimates for constant amplitude loading. | 5 |
| Multiaxial stresses and strains. | 3 |
| Fatigue from real load histories. | 4 |
| Environmental effects. | 5 |
| Joints and fatigue of mechanical components. | 5 |
| Partial exams. | 3 |
| Total hours: (equivalent to contact period) | 45 |

8. Grading System

Quantifiable (letters) Not Quantifiable

9. Evaluation Strategies

| | Quantity | Percent |
|--|----------|-------------|
| <input checked="" type="checkbox"/> Exams | 3 | 50 |
| <input checked="" type="checkbox"/> Final Exam | 1 | 30 |
| <input type="checkbox"/> Short Quizzes | | |
| <input type="checkbox"/> Oral Reports | | |
| <input type="checkbox"/> Monographies | | |
| <input type="checkbox"/> Portfolio | | |
| <input checked="" type="checkbox"/> Projects | 1 | 20 |
| <input type="checkbox"/> Journals | | |
| <input type="checkbox"/> Other, specify: | | |
| TOTAL: | | 100% |

10. Bibliography:

Textbook:

Bathia, C., and Pineau, A. (2013). *Fatigue of Materials and Structures: Application to Damage and Design*. New Jersey: Wiley. **

* These are classical handbooks

** These books are key classic references and remain as the top books for the subjects covered in the course and there are no up-to-date textbooks to substitute these books.

11. Law 51: The Comprehensive Educational Services Act for People with Disabilities:

States that after identifying with the instructor and the institution, the student with disabilities will receive reasonable accommodation in their courses and evaluations. For more information, contact the Department of Counseling and Psychological services at the Office of the Dean of Students (Office DE 21) or call 787-265-3864 or 787-832-4040 x 3772, 2040 and 3864.

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. Certification 06-43 of the Academic Senate

"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 06-43 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.

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.

Revised: February, 2019