



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



### Course Syllabus

<b>1. General Information:</b> Alpha-numeric codification: INME 4011 Course Title: Design of Machine Elements I Number of credits: 3 Contact Period: Three hours of lecture per week
<b>2. Course Description:</b> English: Application of strength of materials and materials science in machine element design. Introduction and use of static and dynamic failure theories in the design of machine elements. Spanish: Aplicación de resistencia de materiales y ciencias de materiales en diseño de elementos de máquinas. Introducción y uso de teorías de fallos tipos estático y dinámico en diseño de elementos de máquina.
<b>3. Pre/Co-requisites and other requirements:</b> Pre-requisites: (INME 4107 or INGE 4001) and (INGE 4019 or INGE 4012) and INME 4005
<b>4. Course Objectives:</b> <ul style="list-style-type: none"><li>• After successful completion of this class, students will be able to: Determine the stress, strain and deflection of a machine element using concepts of material properties, fundamentals of kinematics, statics and strength of materials</li><li>• Identify, formulate, and solve machine element problems by applying principles of engineering, science, and mathematics (1);</li><li>• Use engineering knowledge to generate an engineering design for mechanical components and assemblies that are capable of efficiently performing specific tasks (2);</li><li>• Identify loadings of machine elements and perform stress analysis according to design criteria and specified safety factors (2);</li><li>• Identify the phenomena of mechanism wear, surface contact stresses, and surface fatigue;</li><li>• Implement approaches to failure prediction for machine elements under static and repeated loading;</li><li>• Judiciously select appropriate materials for the designed machine component;</li><li>• Make clear and effective technical presentations, both in terms of form as well as content, of his/her work and write clear technical reports describing his/her work (3).</li></ul>
<b>5. Instructional Strategies:</b> <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:**

Materials, equipment, and physical facilities needed to fulfill the course objectives.

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

<b>General Topics</b>	<b>Contact Hours</b>
Introduction to Design	2
Review of Materials Processes	3
Review of Kinematics and Load Determination	3
Review of Stress, Strain, and Deflection	9
Reliability-based Design	3
Static Failure Theories	8
Fatigue Failure Theories	8
Surface Failure	3
Finite Element Analysis	3
Tests	3
<b>Total hours: (equivalent to contact period)</b>	<b>45</b>

**8. Grading System**

Quantifiable (letters)  Not Quantifiable

**9. Evaluation Strategies**

	<b>Quantity</b>	<b>Percent *</b>
<input checked="" type="checkbox"/> <b>Exams</b>	<b>2-3</b>	<b>50-75</b>
<input checked="" type="checkbox"/> <b>Final Exam **</b>	<b>1</b>	<b>0-25</b>
<input checked="" type="checkbox"/> <b>Short Quizzes</b>	<b>0-3</b>	<b>0-10</b>
<input checked="" type="checkbox"/> <b>Oral Reports</b>	<b>0-4</b>	<b>0-25</b>
<input type="checkbox"/> <b>Monographs</b>		
<input type="checkbox"/> <b>Portfolio</b>		
<input checked="" type="checkbox"/> <b>Projects</b>	<b>0-1</b>	<b>0-50</b>
<input type="checkbox"/> <b>Journals</b>		
<input checked="" type="checkbox"/> <b>Other, specify: Homework</b>	<b>0-5</b>	<b>0-25</b>
<b>TOTAL:</b>		<b>100%</b>

\* All evaluation strategies will add to 100%

\*\* In design courses a capstone project may replace the final exam.

**10. Bibliography:****Textbook:**

Budynas, R. G. (2014). Shigley's mechanical engineering design. New York, N.Y.: McGraw Hill Education.

**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*