



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 4058 Course Title: Computer Aided Design Number of credits: 3 Contact Period: Three hours of lecture per week	
<b>2. Course Description:</b>	
English: Study of the principles of computer aided engineering design applied to mechanical engineering problems. Introduction to finite element and design optimization techniques. Use of programming and commercial software to design mechanical system.	
Spanish: Estudio de los principios de diseño de ingeniería asistido por computadoras aplicado a problemas de Ingeniería Mecánica. Introducción a técnicas de elementos finitos y diseño de optimización. Uso de programación y programa comercial para diseñar sistemas mecánicos.	
<b>3. Pre/Co-requisites and other requirements:</b>	
Prerequisites: INME 4012 and INME 4015	
<b>4. Course Objectives:</b>	
Upon successful completion of this course, students:	
<ul style="list-style-type: none"> <li>● Students will understand the mathematical and physical principles underlying the FEM as applied to solid mechanics, thermal analysis and select aspects of fluid mechanics.</li> <li>● Be able to create his/her own FEM computer programs, for mathematically simple but physically challenging problems.</li> <li>● Be able to compare FEM results to results obtained analytically or experimentally</li> <li>● Demonstrate the ability to optimize a component using FEM analysis.</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.</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:	
<b>6. Minimum or Required Resources Available:</b>	
Classroom, projector and software.	
<b>7. Course time frame and thematic outline</b>	
<b>General Topics</b>	<b>Contact Hours</b>
Introduction to design	3

Review of matrix algebra, strength of materials, elasticity theory and energy methods	6
Trusses and beams with stiffness derivations	3
Potential energy method	3
Applied 1D, 2D and 3D finite elements	6
Parametric formulation	3
Structural dynamics and modal analysis	6
Surface Response Optimization method	6
Topological optimization	6
Tests	3
<b>Total hours: (equivalent to contact period)</b>	<b>45</b>

### 8. Grading System

Quantifiable (letters)  Not Quantifiable

### 9. Evaluation Strategies

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

Logan, D. L. (2017). *A first course in the finite element method*. Boston: Cengage learning.

### 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*