



University of Puerto Rico  
 Mayagüez Campus  
 College of Engineering  
 Department of Mechanical Engineering  
 M.S./Ph.D. in Mechanical Engineering



## Course Syllabus

<b>1. General Information:</b>	
Alpha-numeric codification: INME 6107 Course Title: Smart Materials and Devices Number of credits: 3 Contact Period: Three hours of lecture per week	
<b>2. Course Description:</b>	
English: Study of smart materials and their classification according to their response and stimuli ability. Discussion of the effect of crystalline structure on the properties of piezoelectric materials, magnetostrictive alloys, shape memory alloys and others. Application of smart materials in actuators and sensors.	
Spanish: Estudio de materiales inteligentes, su clasificación según su respuesta y habilidad para ser estimulada. Discusión del efecto de la estructura cristalina en las propiedades de los materiales piezoeléctricos, aleaciones magnetostrictivas, aleaciones con memoria de forma y otros materiales. Aplicación de materiales inteligentes en actuadores y sensores.	
<b>3. Pre/Co-requisites and other requirements:</b>	
Pre-requisite: Authorization of the Director of the Department	
<b>4. Course Objectives:</b>	
<ul style="list-style-type: none"> <li>• Demonstrating ability to carry out basic design of actuators and sensors using smart materials.</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 checked="" 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.	
<b>7. Course time frame and thematic outline</b>	
<b>General Topics</b>	<b>Contact Hours</b>
Overview of smart materials	3
Classification of smart materials	5
Crystal structure and microstructure	5
Piezoelectric and electrostrictive materials	6
Magnetostrictive and magnetolectric materials	6

Shape memory alloys	6
Application of smart materials	12
Exams and reviews	2
<b>Total hours: (equivalent to contact period)</b>	<b>45</b>

### 8. Grading System

Quantifiable (S/NS)  Not Quantifiable

### 9. Evaluation Strategies

	Quantity	Percent
<input checked="" type="checkbox"/> Exams	1	30
<input checked="" type="checkbox"/> Final Exam	1	40
<input type="checkbox"/> Short Quizzes		
<input checked="" type="checkbox"/> Oral Reports	1	30
<input type="checkbox"/> Monographies		
<input type="checkbox"/> Portfolio		
<input type="checkbox"/> Projects		
<input type="checkbox"/> Journals		
<input type="checkbox"/> Other, specify:		
<b>TOTAL:</b>		<b>100%</b>

### 10. Bibliography:

#### Textbook:

Haghi, A. K., and G. E. Zaikov. 2011. *Nano-Scaled and Smart Materials (Nanotechnology Science and Technology)*. New York: Nova Science Publishers. [Available at the Circulation Collection (TA418.9. N35 H338 2011), UPRM General Library]

#### **Other resources:**

- Schwartz, Mel. 2008. *Smart Materials*. Florida: CRC Press.  
<http://dx.doi.org/10.1201/9781420043730>. [Available via ENGnetBASE, UPRM General Library Databases] (\*\*)
- Electronic resources available through the Library's website:  
<http://www.uprm.edu/library/cre/listdbsp.php?l=1&st=0&topic=77>.

\*\* 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*