



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



Course Syllabus

1. General Information:	
Alpha-numeric codification: INME 6007 Course Title: Advanced Air Conditioning Number of credits: 3 Contact Period: Three hours of lecture per week	
2. Course Description:	
English: Advanced study of psychometrics, dynamic models for buildings, simultaneous heat and mass transfer processes. Energy efficient cooling and heating of building using annual energy consumption criterion and conventional and non-conventional air conditioning systems.	
Spanish: Estudio avanzado de psicometría, modelos dinámicos para edificios, procesos simultáneos de transferencia de calor y masa. Eficiencia energética de enfriamiento y calentamiento para edificios utilizando el criterio de consume energético y sistemas de aire acondicionado convencionales y no-convencionales.	
3. Pre/Co-requisites and other requirements:	
Prerequisites: INME 6001 or Authorization of the Director of the Department.	
4. Course Objectives:	
<ul style="list-style-type: none"> • Applying transient load calculations for a building. • Analyzing energy-efficiency measures for commercial buildings. • Designing a complete energy-efficient HVAC system for a building. • Finding the annual energy consumption of a building HVAC system. 	
5. Instructional Strategies:	
<input 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:	
Classroom, projector	
7. Course time frame and thematic outline	
General Topics	Contact Hours
Fundamentals of heat transfer and fluid mechanics in building systems	3
Review of HVAC codes	3
Direct contact heat and mass transfer between moist air and water	4

Transient loads calculation using transfer function method	7
Conventional and non-conventional heating and cooling equipment	5
Energy-efficiency analysis and selection of different component of an HVAC system	5
Analysis of energy-efficiency measures for commercial buildings	4
Annual energy consumption estimation of a building HVAC system	5
Topics in advanced control system design for energy efficient buildings	5
Tests	4
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	65
<input type="checkbox"/> Final Exam		
<input type="checkbox"/> Short Quizzes		
<input type="checkbox"/> Oral Reports		
<input type="checkbox"/> Monographies		
<input type="checkbox"/> Portfolio		
<input checked="" type="checkbox"/> Projects	1	35
<input type="checkbox"/> Journals		
<input type="checkbox"/> Other, specify:		
TOTAL:		100%

10. Bibliography:

Textbook:

Clarke, Joseph. 2001. *Energy Simulation in Building Design*. New York: Routledge. (**)

Other resources:

1. Krarti, Moncef. 2010. *Energy Audit of Building Systems: An Engineering Approach*. Florida: CRC Press. <http://www.crcnetbase.com/isbn/978-1-4398-2871-7>. [Available via MechanicalENGINEERINGnetBASE, UPRM General Library Databases]
2. Kreider, Jan F, ed. 2000. *Handbook of Heating, Ventilation, and Air Conditioning*. Florida: CRC Press. <http://dx.doi.org/10.1201/9781420036466>. [Available via MechanicalENGINEERINGnetBASE, UPRM General Library Databases] (*)
3. Schobeiri, Meinhard. 2010. *Fluid Mechanics for Engineers: A Graduate Textbook*. New York: Springer. <http://dx.doi.org/10.1007/978-3-642-11594-3>. [Available via Springer eBooks, UPRM General Library Databases].
4. American Society of Heating, Refrigerating and Air-Conditioning Engineers. 2008. *ASHRAE handbook. Heating, Ventilating, and Air-Conditioning Systems and Equipment*. Atlanta, GA: American Society of Heating, Refrigerating and Air Conditioning Engineers [Available at the Reference Collection (TH7015. A74 2008), UPRM General Library] (**)
5. Electronic resources available through the Library's website:
<http://www.uprm.edu/library/cre/listdbsp.php?l=1&st=0&topic=77>.

* 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