



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



Course Syllabus

1. General Information: Alpha-numeric codification: INME 4015 Course Title: Heat Transfer Number of credits: 3 Contact Period: Three hours of lecture per week
2. Course Description: English: Fundamentals of steady and unsteady conduction, forced and natural convection and radiation. Introduction to heat exchangers. Spanish: Fundamentos de conducción estable e inestable, convección forzada y natural y radiación. Introducción a los intercambiadores de calor.
3. Pre/Co-requisites and other requirements: Pre-requisites: MATE 4009 and INGE 3016 and (INME 4001 or INME 4045) and (INGE 4015 or INGE 4010)
4. Course Objectives: After successful completion of this class, students will be able to: <ul style="list-style-type: none">• Identify, formulate, and solve conduction, and forced and natural convection problems using engineering and science governing equation along with complex boundary condition (1);• Implement design solutions to mixed mode heat transfer engineering problems that meet specified needs (2);• Evaluate steady and unsteady heat conduction in one and multi dimensions;• Apply finite difference method to heat transfer problem with particular emphasis on heat conduction;• Evaluate the radiant heat transfer between solid bodies, black or gray;• 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);• Describe how engineering analysis fits into the larger framework of professional engineering guided by ethical, environmental, and professional considerations (4).
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
One-dimensional steady state conduction heat transfer	8
Multidimensional steady state conduction heat transfer with numerical methods	5
Lumped and multidimensional transient conduction heat transfer with numerical methods	5
Forced and free convection heat transfer	11
Analysis and design of heat exchangers	7
Radiation heat transfer	6
Examinations	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	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
TOTAL:		100%

* All evaluation strategies will add to 100%

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

10. Bibliography:**Textbook:**

Çengel, Y. A., Ghajar, A. J., & Kanoglu, M. (2015). *Heat and mass transfer: Fundamentals and applications*. New York: McGraw-Hill.

Other references:

- Mills, A.F., (1999) Basic Heat and Mass Transfer, Prentice Hall, Upper Saddle River, NJ.
- Hahn, D.W. and Özisik, M.N., (2012) Heat Conduction, 3rd ed., Wiley, Hoboken, NJ.
- Kays, W.M. and Crawford, M., (1993) Convective Heat and Mass Transfer, McGraw-Hill, New York, NY.
- Çengel, Y.A and Cimbala, J.M., (2017) Fluid Mechanics: Fundamentals and Applications, 4th ed., McGraw Hill Education, New York, NY.

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