THE UNIVERSITY OF TEXAS-PAN AMERICAN

College of Engineering and Computer Science

Department of Mechanical Engineering

MECE 3160 Heat Transfer Lab – 1 Credit – Fall 2011

Room: ENGR 2.466 **Time:** MT 5:45 – 8:25 pm

Instructor: Dr. Constantine Tarawneh

Lab Assistant: Andrei Vaipan

Email: avaipan@utpa.edu

Course Prerequisites: Credit for or enrollment in MECE 3360 (Heat Transfer).

Prerequisite Knowledge:

- Derivatives, integrals, and their applications.
- Use of computer spreadsheets.
- Basic measurements and instrumentations.
- Modes of heat transfer.

Textbook: Lab Handouts

Course Objectives:

1. Learn the principle and applications of conduction heat transfer (thermal conductivity measurement).
2. Understand and measure the thermal conductivity of liquids and gases.
3. Learn the principle and applications of radiation heat transfer (thermal emissivity measurement).
4. Learn the principle and applications of free and forced convection heat transfer.
5. Get familiar with different kinds of heat exchangers.
6. Understand the refrigeration cycle; its components, operation, and temperature, pressure, and flow rate measurements.
7. Introduce the concept of the thermal boundary layer thickness.
8. Introduce the basic theory of boiling and condensation heat transfer.

Topics:

- Conduction Heat Transfer in Solids.
- Conduction Heat Transfer in Liquids and Gases.
- Free and Forced Convection Heat Transfer.
- Radiation Heat Transfer.
- Refrigeration Cycle.
- Thermal Boundary Layer.
- Boiling and Condensation Heat Transfer.

Semester Project:

Each group will be required to conduct an experiment pertaining to heat transfer. Each group will be required to hand in a full comprehensive report and give an oral presentation during which they will have to perform the experiment for the rest of the class and then answer questions. The group members will have to collect data and present their results and conclusions. A project proposal is due the week of October 3rd, 2011. The proposal must include materials needed, and a brief overview of the suggested experimental procedure. The semester project full report will be due the week of November 28th, 2011.

Grading Policy:

There will be eight analysis write-ups each worth 10 points, and a semester project worth 20 points. The project will be graded based on presentation, technical content, and overall quality of report.

Drop Policy:

Students can withdraw from a course through the *Office of the Registrar* on or prior to:

- September 14th, 2011, Wednesday: Twelfth class day (Census date); courses dropped by this date do not count toward six course drop limit.
- September 27th, 2011, Tuesday: Last day to change course to non-credit.
- November 14th, 2011, Monday: Last day to drop a class or withdraw from the University with a grade of "DR" or "W" recorded. After this date, student remains enrolled in course and receives whatever letter grade he/she earns.

American Disabilities Act Statement:

If you have a documented disability which will make it difficult for you to carry out the work as I have outlined and/or if you need special accommodations/assistance due to a disability, please contact the Office of Services for Persons with Disabilities (OSPD), Emilia Ramirez-Schunior Hall, Room 1.101 immediately, or the Associate Director at MAUREEN@UTPA.EDU, 316-7005. Appropriate arrangements/accommodations can be arranged.

Course Outcomes and Assessment:

At the conclusion of the course, the student should be able to:

1. Gain hands-on knowledge of the three different modes of heat transfer (A, R, P).
2. Perform mechanical engineering measurements pertaining to heat transfer (A, R, P).
3. Operate modern computer-based data acquisition system (P, OP).
4. Compare theoretical results obtained from literature to experimental data acquired in the laboratory (A, R, P, OP).
5. Design experiments and interpret the data to solve a given problem, and present the findings (A, R, P, OP).
6. Work on a heat transfer related project within a team structure (R, P, OP).
7. Prepare engineering reports, both written and oral (A, R, OP).

Key: A-Analysis, R-Full Report, P-Project, OP-Oral Presentation

Contribution of Course Outcomes to Program Outcomes

	1	2	3	4	5	6	7	8	S1	S2	S3	E1	E2	E3	E4	E5
1	X								X	X	X		X			
2		X						X			X					X
3		X						X	X							X
4	X							X	X	X	X		X			
5	X	X	X		X				X	X	X		X		X	
6	X	X	X	X	X				X				X		X	X
7				X	X						X					

Program Educational Outcomes

It will be demonstrated that the student:

1. Is able to use knowledge of mathematics, basic sciences and engineering to analyze (identify, formulate, and solve) problems in mechanical engineering.
2. Is able to design and conduct experiments and interpret the results.
3. Is able to design mechanical devices, systems or processes that meet given specifications.
4. Is able to function in multi-disciplinary teams.
5. Is able to communicate ideas effectively in graphical, oral and in written media.
6. Understands the professional responsibility of an engineer and how engineering solutions impact safety, economics, ethics, politics, and societal, cultural and contemporary issues.
7. Understands the need for life long learning to keep abreast of current practice.
8. Is able to use state of the art computational hardware and software for analysis, design and documentation (techniques, skills, and modern engineering tools necessary for engineering practice).

Program Specific Outcomes for Mechanical Engineering

Fundamentals in Science and Mathematics: It will be demonstrated that the student:

S1) Has knowledge of chemistry and calculus-based physics with depth in at least one.

S2) Has the ability to apply advanced mathematics to problems involving thermal and mechanical systems.

S3) Has the ability to apply statistics and linear algebra to problems involving thermal and mechanical systems.

Fundamentals in Engineering: It will be demonstrated that the student:

E1) Has the ability to create and annotate two-dimensional drawings, and generate three dimensional computer based solid models of mechanical components.

E2) Has the ability to design and analyze components and systems for mechanical and energy performance.

E3) Has the ability to specify and evaluate materials and manufacturing steps for mechanical components.

E4) Has the ability to conceive and conduct experiments to measure the performance of materials, components and systems and to communicate the results.

E5) Has the ability to acquire new skills and specialized knowledge from published sources.

ACKNOWLEDGEMENT OF RECEIPT OF SYLLABUS

I have received a copy of the syllabus for **MECE 3160 Heat Transfer Lab** and have been informed by the instructor that it is my responsibility to **carefully** read and understand this document.

_____
Student ID Number

_____
Printed Name

_____
Signature

_____
Date