

MEEN 4313 THERMAL SYSTEMS DESIGN COURSE OVERVIEW

Course

Description:

ME 4313 - Thermal Systems Design. 3 Credit Hours. This course covers analysis, modeling and design of thermal systems involving applications of thermodynamics, fluid mechanics, heat transfer, and engineering economics. The students will complete an engineering project involving design of a thermal or energy system considering realistic engineering constraints, component selection, system modeling and simulation, and life-cycle economic analysis. Prerequisites: MEEN 3310, MEEN 3311, MEEN 3380

Course

Objectives:

To provide mechanical engineering seniors an introduction to engineering design and design processes of thermal and energy systems utilizing fundamental knowledge of thermal and fluid sciences

To develop design skills in students by completing a design project in thermal and/or energy system as a group, preparing a technical report and making a presentation in class on the design project

Course

Outcomes:

After the course, the students will be able to do the followings:

Apply design processes and procedures to the design of thermal systems.

Utilize engineering specification to choose and size various components for the design of thermal systems.

Compute cost of individual components as well as life cycle cost of a thermal system.

Develop flowsheeting of the thermal systems for design purposes.

Apply mathematical modeling and simulation techniques in the design of thermal systems.

**MEEN 4313 THERMAL SYSTEMS DESIGN
FALL 2017
SYLLABUS**

- Instructor:** Ping He, PhD
Department of Mechanical Engineering
1624 Cherry Engineering Bldg.
Tel: (409) 880-7129
E-mail: phe@lamar.edu
- Classroom:** 2603 Cherry Engineering Bldg.
Class Hours: 12:45 p.m. – 2:05 p.m., Tuesday, Thursday
Office Hours: 9:00 p.m. – 11:00 p.m., Tuesday, Thursday
- Required Textbook:** Stoecker, W., *Design of Thermal Systems*, 3rd Edition, McGraw Hill, 1989.
- Reference:**
- Boehm, R. F., *Design Analysis of Thermal Systems*, John Wiley & Sons, 1987. ISBN 0-471-83204-9
 - Hodge, B. K., and Taylor, R. P., *Analysis and Design of Energy Systems*, Prentice Hall, 3rd Edition, 1999.
 - Janna, W. S., *Design of Fluid Thermal Systems*, Brooks/Cole, 2nd Edition, 1998.
 - Burmeister, *Elements of Thermal-Fluid System Design*, Prentice Hall, 1978.
 - Jaluria, *Design and Optimization of Thermal Systems*, McGraw Hill, 1998.
 - Bejan, A., Tsatsaronis, G and Moran, Michel, “Thermal Design and Optimization” John Wiley and Sons, Inc., 1996.
 - N. V. Suryanarayana, Oner Arici, and N. Suryanarayana, *Design and Simulation of Thermal Systems*, McGraw Hill, 2002.
- Prerequisites:** MEEN 3310, MEEN 3311, MEEN 3380
- Grading:** Attendance – 10%
Quizzes (4) – 20%
Simulation Projects (2) – 40%
Design Project (1) – 30%
- Letter Grade Assignment:** 51-59% F, 60-69% D, 70-79% C, 80-89% B, 90-100% A
- Class Policy:** All cell phones must be turned off during class time. No late entry (**after 10 minutes of class start**) to classroom. NO makeup for quizzes except in the case of a medical emergency. No late reports will be accepted. Reports must be submitted in both hard copy (hand in during class) and soft copy (to Blackboard course website).
- Attendance:** Attendance is required at each class. **Missing class more than 3 times during the semester results in complete loss of attendance grade. If a student is called to answer a question, and is not present after 10 minutes of class start, one absence will be counted for that student, except for a pre-informed, executed absence.**
- Final Exam:** NA

Plagiarism and Cheating:

All forms of any suspected cheating and plagiarism will be reported to the University Authority. [The Lamar University Student Handbook](#)¹ states:

Any student found guilty of dishonesty in any phase of academic work will be subject to disciplinary action. Punishable offences include, but are not limited to, cheating on an examination or academic work which is to be submitted, plagiarism, collusion, and the abuse of resource materials.

One aspect of the handbook's definition of cheating is, "purchasing, or otherwise acquiring and submitting as one's own work any research paper or other writing assignment prepared by an individual or firm". Plagiarism is defined as, "the appropriation and the unacknowledged incorporation of another's work or ideas into one's own offered for credit".

Students seeking to avoid plagiarism should consult with the course instructor, recent handbooks like The Little, Brown Handbook and the MLA Handbook for Writers of Research Papers, consultants in the Writing Center, or websites such as <https://students.lamar.edu/academic-support/academic-policies.html>.

The Texas State University System has established the following Disciplinary Procedures for Academic Dishonesty:

- (1) **Academic Process.**
 - a. All academic dishonesty cases may be first considered and reviewed by the faculty member. If the faculty member believes that an academic penalty is necessary, he/she may assign a penalty but must notify the student of his/her right to appeal to (i) the department chair, (ii) the dean, and eventually, to (iii) the vice president for academic affairs (whose decision shall be final) before imposition of the penalty.
 - b. At each step in the process, the student shall be entitled to written notice of the offense and/or of the administrative decision, and opportunity to respond, and an impartial disposition as to the merits of his/her case.
 - c. After completion of the academic process, the academic officer making final disposition of the case shall refer the matter to the chief student affairs officer for any additional discipline that may be appropriate.

- (2) **Disciplinary Process.** In the case of flagrant or repeated violations, the chief student affairs officer may take such additional disciplinary action as he/she deems appropriate. No disciplinary action shall become effective against the student until the student has received procedural due process under *Subsection 5.6* and following exception as provided under *Subsection 5.15* of the [Texas State University System Board of Regents Handbook](#).

The instructor will report **all** suspected cheating and plagiarism to the University Authority, and suggest "**F**" as a penalty for **all** forms of cheating and plagiarism. He will **not** have conversations with the suspected student(s) about the cheating and plagiarism acts **before nor after the report**. The student(s) have the right to appeal to administrators according to the Academic Process described above. The instructor will **not** be involved in the judgment of the case and the decision of the disciplinary actions.

¹ <https://students.lamar.edu/student-handbook.html>

Students with Disabilities:

Lamar University is committed to providing equitable access to learning opportunities for all students. The Disability Resource Center (DRC) is located in the Communications building room 105. Office staffs collaborate with students who have disabilities to provide and/or arrange reasonable accommodations.

For students:

If you have, or think you may have, a disability (e.g., mental health, attentional, learning, chronic health, sensory, or physical), please contact the DRC at 409-880-8347 or drc@lamar.edu to arrange a confidential appointment with the Director of the DRC to explore possible options regarding equitable access and reasonable accommodations.

Emergency Procedures

In the event of an announced campus closure in excess of four days due to a hurricane or other disaster, students are expected to login to Lamar University's website's homepage (www.lamar.edu) for instructions about continuing courses remotely.

Many types of emergencies can occur on campus; instructions for severe weather or violence/active shooter, fire, or chemical release can be found at:

<http://www.lamar.edu/about-lu/administration/risk-management/index.html>.

Following are procedures for the first two:

Severe Weather

- Follow the directions of the instructor or emergency personnel.
- Seek shelter in an interior room or hallway on the lowest floor, putting as many walls as possible between you and the outside.
- If you are in a multi-story building, and you cannot get to the lowest floor, pick a hallway in the center of the building.
- Stay in the center of the room, away from exterior walls, windows, and doors.

Violence/Active Shooter (CADD)

- **CALL** - 8-3-1-1 from a campus phone (880-8311 from a cell phone). Note: Calling 9-1-1 from either a campus phone or cell phone will contact Beaumont City Police Dispatch rather than University Police.
- **AVOID**- If possible, self-evacuate to a safe area outside the building. Follow directions of police officers.
- **DENY**- Barricade the door with desks, chairs, bookcases or any other items. Move to a place inside the room where you are not visible. Turn off the lights and remain quiet. Remain there until told by police it is safe.
- **DEFEND**- Use chairs, desks, cell phones or whatever is immediately available to distract and/or defend yourself and others from attack.

Academic Continuity Statement

In the event of an announced campus closure in excess of four days due to a hurricane or other disaster, students are expected to login to Lamar University's website's homepage (www.lamar.edu) for instructions about continuing courses remotely.

Detail Topics

Week 1	Engineering Design Process, Design of Thermal Systems
Week 2	Review of Fluid Mechanics, Pumps
Week 3	Project #1 Assignment , Fans, Compressors, and Turbines
Week 4	Review of Heat Transfer, Heat Exchanger Selection and Design, Quiz #1
Week 5	Heat Exchanger Selection and Design
Week 6	Cooling Towers, Refrigeration Systems
Week 7	Equation Fitting, Project #1 Due, Quiz #2
Week 8	Project #2 Assignment , Engineering Economics, Life Cycle Cost, and Cost Estimation
Week 9	System Identification and Modeling
Week 10	Mathematical Modeling: Power Systems
Week 11	Simulations: Power Systems, Quiz#3
Week 12	Mathematical Modeling: Refrigeration Systems
Week 13	Project #2 Due, THANKSGIVING
Week 14	Simulations: refrigeration Systems, Quiz#4
Week 15	Engineering Codes and Standards, Design Project Report Due, Project Presentation

The lecture topics may change depending on the discretion of the instructor.