University of Arkansas
MEEG 4483/5483 - Thermal Systems Analysis and Design - Online
Course materials on Blackboard

Instructor - Rick J. Couvillion, PhD, PE, ME208, X 54155, rjc@uark.edu, **website**

Text - No text. Use instructor notes that are accessed via Blackboard.

Software - Excel and Visual Basic will be used on most assignments. Install Excel's 'Solver' add-in. Excel spreadsheets with built-in Visual Basic functions will also be used and are available in the 'Downloads' folder on Blackboard. Matlab may be used later in the course and is available on U of A's VLab. Instructions for accessing Matlab via VLab are available in the 'Downloads' folder on Blackboard. A student version can be purchased.

References

- Steven G Penoncello, *Thermal Energy Systems - Design and Analysis*, CRC Press, 2015.
- B.K. Hodge and Robert P. Taylor, *Analysis and Design of Energy Systems*, 3rd ed., Prentice-Hall, 1999.
- Louis C. Burmeister, *Elements of Thermal-Fluid System Design*, Prentice Hall, 1998.
- Yogesh Jaluria, *Design and Optimization of Thermal Systems*, McGraw-Hill,1998.
- R.F. Beohm, *Design Analysis of Thermal Systems*, Wiley, 1987.
- W.F. Stoecker, *Design of Thermal Systems*, 3rd ed., McGraw-Hill, 1989.
- William S. Janna, Design of Thermal Systems, 2nd Ed., PWS, 1998.

Prerequisite - Fluid Mechanics, Heat Transfer, Excel, Matlab, some programming.

Objectives

- Development of awareness and understanding of the relationships among the thermal sciences in the design process.
- Knowledge of thermal system component characteristics and their effect on overall system performance.
- Modeling of thermal systems and components.
- Thermal systems optimization.

Lectures - Recorded lectures are accessed via a 'XXXXXX Lecture Recordings' link on Blackboard. The recorded lectures are numbered 01-25. There are lecture notes that accompany the recorded lectures that can be downloaded via the 'Lecture Notes and Schedule' link on Blackboard. The lecture notes are also numbered 01-25, and the content roughly corresponds to that in the recorded lectures. On average, 3 recorded lectures corresponding to 3 sets of lecture notes per week will be covered as shown on the course content and schedule shown below.

Drills - There will usually be an online drill each week using Blackboard Collaborate. Instructions for signing on to a Collaborate drill session are available in the 'Downloads' folder on Blackboard. Drills will focus on questions about the lectures and the homework. There are some recorded drill sessions that can also be accessed via the 'XXXXXX Lecture Recordings' link on Blackboard. The drill recordings are labeled as such.

Communications - UA emails for all class members will be provided to encourage collaboration. If the class finds discussion groups useful, they will be set up on blackboard.

Grading - Three Exams - 80%. Homework - 20%. Exams require a proctor approved by the instructor and the MSE program. Approval form can be downloaded **here**. Graduate and honors students will have extra project work assigned.

Homework - Homework assignments 01 - 04 must be submitted before Exam 01 will be given. Assignments 05 - 07 must be submitted before Exam 02. Homework 08 - 09 and the project must be submitted before Exam 03.

Academic Honesty - Academic honesty is expected, and dishonesty as described in the UA academic integrity policy will be penalized. Penalties will range from getting zero on a homework, quiz, project, or exam to failure of the course and/or report to the College of Engineering Academic Integrity Monitor. However, these penalties will pale in comparison to the instructor knowing that you are a person who cannot be trusted. If a potential employer asks, the instructor will be obligated to express his concerns about your integrity.

MEEG 4483 - Thermal Systems Analysis and Design
Lecture Notes and Schedule - Online - 8 Week

Week	Lecture Notes	Topic
1	Lecture 01	Fluid Mechanics Energy Equation and Head Loss
	Lecture 02	Fluid Flow Resistance
	Lecture 03	Branching Flows
2	Lecture 04	Piping Networks and Hardy-Cross Solution
	Lecture 05	Generalized Hardy-Cross
	Lecture 06	Pumps
	Lecture 07	Pump Affinity Laws, Specific Speed
3	Lecture 08	Viscous Correction, Cavitation, Parallel/Series Operation
	Lecture 09	Closed Loops, Savings with Variable Speed
	Lecture 10	Duct Systems
		Exam 01 - Lecture Notes 01-09, Lecture Recordings 01-09
4	Lecture 11	Fans
	Lecture 12	Air Compressors
	Lecture 13	Heat Exchanger Review
5	Lecture 14	Heat Exchanger Analysis
	Lecture 15	Manufacturer HX Information
	Lecture 16	Heat Recovery
6	Lecture 17	Modeling and Simulation
		Exam 02 - Lecture Notes 10-16, Lecture Recordings 09-17
	Lecture 18	Modeling and Simulation - Continued
	Lecture 19	Economics, Optimization Review
7	Lecture 20	Optimization Examples
	Lecture 21	More Optimization Examples
		Project Descriptions
8	Lecture 23	Transient Analysis
	Lecture 24	Transient Analysis - cont.
	Lecture 25	Uncertainty in Thermal Systems
		Exam 03 - Lecture Notes 17-25, Lecture Recordings 17-25

Note: Lecture recordings are numbered 01-25. There are also recorded drill/review sessions.