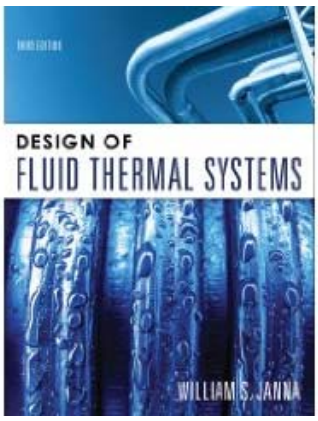
ME 435 - Thermal Energy System Design
Fall 2012

Course Instructor and Contact Information

Instructor:	Dr. Tao Xing
Office:	EP 324F
Office Hours:	2:30 – 3:30 MWF
Email contact:	Xing@uidaho.edu
Research Website:	http://www.taoxing.net

Course Textbook

The course textbook is:



Janna, W.S., Design of Fluid Thermal Systems, 3rd edition, PWS-Kent, Boston, 2010.

In addition to the course textbook, several additional handouts will be made available on the course BbLearn website.

Course Schedule: Lecture: 1:30 − 2:20pm MWF at TLC 223

Course Description from UI Catalog

> ME 435 **Thermal Energy Systems Design** (3 cr). Application of fluid mechanics, thermodynamics and heat transfer in the design of thermal energy systems; topics include thermal energy system component analysis and selection, component and system simulation, dynamic response of thermal systems, and system optimization. Prereq: Engr 335 (Engineering Fluid Mechanics) and ME 345 (Heat Transfer).

Course Web Site

All course-related material is available on the course BbLearn website. If you are a registered student in the class, you will automatically receive an invitation to the class website. Check it frequently. Download any items of interest that you find there!

Reading and Homework Assignments

Reading and homework assignments will be posted on the course website. Homework assignments are due at the beginning of the class period posted on the course website. Homework not submitted at the beginning of the class period is considered late and will receive a grade of zero.

Software

Thermal energy system analysis and design often requires the solution of simultaneous nonlinear equations. In addition, quick access to thermophysical properties of the working fluids used in the system is desirable. Modern computer software is available that can be used to solve complex systems of equations while accessing thermophysical properties. In this course, we will be using Engineering Equation Solver (EES). The EES software can be found on the course website. This software is for UI Mechanical Engineering Student use only. Please do not distribute the software or the EES.DFT file to anyone other than a UI Mechanical Engineering student. If you have a previous version of EES, it is suggested that you install the newest version from the course website over the old installation.

In addition to EES, you may find REFPROP helpful as well. REFPROP is also available on the course website.

Exams

Two exams will be administered in this course. Exam 1 will cover engineering economy and fluid systems. Exam 2 will cover heat exchangers. More information about these exams will be given in class.

Course Grading

Your total course percentage will be made up of the following,

Homework	20%
In-Class Design Problems (Teams)	30%
Course Design Project (Teams)	30%
Peer Evaluation	10%
Instructor's Assessment	10%

Course grades will be assigned on the following scale: 90-100% = A, 80-89% = B, 70-79% = C, 60-69% = D, <60% = F. The instructor reserves the right to adjust the scale according to overall class performance.

Design Project

The American Society of Mechanical Engineers (ASME) has developed program-specific criteria for mechanical engineering programs seeking accreditation. According to the ASME students must be able to work professionally in bot thermal and mechanical systems areas. The UI Department of Mechanical Engineering interprets *'work professionally'* as meaning having the ability to conduct and communicate effective *engineering design*. To accomplish this objective, some of the homework problems in this course are open-ended, design-type problems. In addition, a course design project will be assigned during the last two weeks of the course. Upon return from Fall Break, the project will be introduced. Team-based project work will commence at that time and continue up until project presentations, which will be conducted

during the Final Exam period. The project results will be summarized and presented in a poster session that will be held during the Final Exam period.

Academic Honesty

As a student enrolled at the University of Idaho, you are bound by the UI Student Code of Conduct. Article II, Section 1 of this code addresses academic honesty. This code states …

> *Cheating on classroom or outside assignments, examinations, or tests is a violation of this code. Plagiarism, falsification of academic records, and the acquisition or use of test materials without faculty authorization are considered forms of academic dishonesty and, as such, are violations of this code. Because academic honesty and integrity are core values at a university, the faculty finds that even one incident of academic dishonesty seriously and critically endangers the essential operation of the university and may merit expulsion.*

Violation of this code will not be tolerated in this course and will be reported immediately to the Office of the Dean of Students for review.

Professionalism

You are training yourself, through formal education, for a career in engineering or a related field. Professional integrity is expected in the workplace, and it is also expected in the classroom. This includes, but is not limited to,

- On-time class attendance. In your professional career, you will no-doubt be involved in many things requiring your on-time attendance (meetings, conferences, etc.). Entering a meeting, presentation, or a class lecture late is a distraction for everyone. It can completely derail the proceedings. Distractions like this can cause those who are trying to focus to lose their concentration.
- Attention during class. It is my sincere hope that you never will have to deal with people talking, whispering, laughing, eating, internet-surfing, or doing other distracting things while you are giving a presentation. For the presenter, this is not a pleasant experience at all. It causes one to lose his/her train of thought very quickly. Activity that distracts the presenter also distracts those in the room who *want* to hear the material in more ways than one. Causing a presenter to stumble because of distractions degrades the quality of the presentation. Distracting activity directly affects those around you who are interested in the subject material and *want* to hear the presentation.

  Respecting the individual presenting the information and respecting your peers that surround you in the room by refraining from distracting activity is truly professional in every sense of the word.
- Cell phones. This falls under the previous category, but it warrants a separate bullet. Hearing a cell phone ring during a presentation is a huge distraction for everyone. Sending and receiving text messages or surfing the internet is distracting you from the material being presented. I respectfully request that you **turn your cell phone off** during the class period.
- Courtesy and respect. These represent the pinnacle of professional integrity. Exhibiting courtesy and respect to others is absolutely essential for effective communication.

Tentative Course Syllabus

Lec	Date	Day	Topic	Notes
1	20-Aug	M	Introduction	
2	22-Aug	W	Engineering Economy - Introduction	
3	24-Aug	F	Engineering Economy - Time value of money	
4	27-Aug	M	Engineering Economy - In-class problems	
5	29-Aug	W	Engineering Economy - Decision making	
6	31-Aug	F	Engineering Economy - Depreciation and taxes	
	3-Sep	M	**LABOR DAY HOLIDAY - UI CLOSED**	
7	5-Sep	W	Unit Systems and Conservation Laws	
8	7-Sep	F	Conservation Laws - Applications	
9	10-Sep	M	Pipes, Tubing, and Flow Calculations	
10	12-Sep	W	Computerized solution of type I, II, III problems	
11	14-Sep	F	Minor losses and series pipe networks	
12	17-Sep	M	Parallel pipe systems	
13	19-Sep	W	In-class design work	
14	21-Sep	F	Economic Diameter I	
15	24-Sep	M	Economic Diameter II	
16	26-Sep	W	Pumps and Pump Performance	
17	28-Sep	F	Pump Selection	
18	1-Oct	M	System Simulation and Pump Cavitation	
19	3-Oct	W	Pumps in Series and Parallel	
20	5-Oct	F	Dimensional Analysis and the Affinity Laws	
21	8-Oct	M	In-class Design Work	
22	10-Oct	W	In-class Design Work	
23	12-Oct	F	In-class Design Work	
24	15-Oct	M	Heat Exchangers I	
25	17-Oct	W	Heat Exchangers II	
26	19-Oct	F	Heat Exchangers III	
27	22-Oct	M	Heat Exchanger Analysis - LMTD	
28	24-Oct	W	Heat Exchanger Analysis - NTU	
29	26-Oct	F	Condensers and Evaporators	
30	29-Oct	M	Double Pipe HX I	
31	31-Oct	W	Double Pipe HX II	
32	2-Nov	F	Double Pipe HX III	
33	5-Nov	M	Shell and Tube HX I	
34	7-Nov	W	Shell and Tube HX II	
35	9-Nov	F	Shell and Tube HX III	
36	12-Nov	M	Plate and Frame HX	
37	14-Nov	W	Cross Flow HX	
38	16-Nov	F	Fluid Flow Measurement	
	19-Nov	M	**FALL BREAK**	
	21-Nov	W	**FALL BREAK**	
	23-Nov	F	**FALL BREAK**	
39	26-Nov	M	Introduction to the Course Design Project	
40	28-Nov	W	Design Project Work	
41	30-Nov	F	Design Project Work	
42	3-Dec	M	Design Project Work	
43	5-Dec	W	Design Project Work	
44	7-Dec	F	Final Class Meeting - Preparation for Poster Session	
45	14-Dec	F	**DESIGN PROJECT POSTER SESSION (12:30 - 2:30)**	