ME417 & ME517 – Turbomachinery
Spring 2018

Course Instructor and Contact Information

Instructor:	Tao Xing, Ph.D., P.E., Associate Professor
Office:	EP 324F
Course Schedule:	10:30am − 11:20pm MWF at JEB 221
Office Hours:	9:30 – 10:20am MWF
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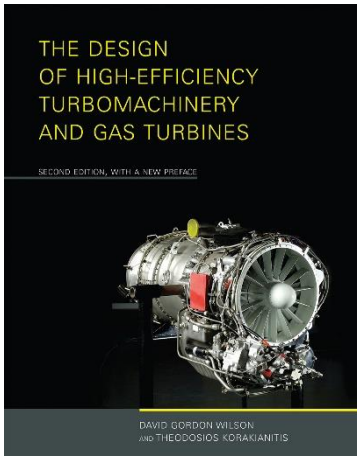
Research Website:	http://www.taoxing.net

Course Textbook



The course textbook is:

David Gordon Wilson and Theodosios Korakianitis, The Design of High-Efficiency Turbomachinery and Gas Turbines, 2nd edition, MIT, 2014, ISBN: 978-0-262-52668-5

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

Course Description from UI Catalog

Introduction to the basic principles of modern turbomachinery. Emphasis is placed on steam, gas (combustion), wind and hydraulic turbines. Applications of the principles of fluid mechanics, thermodynamics and aerodynamics to the design and analysis of turbines and compressors are incorporated. Additional technical research report and presentation are required for graduate credit.

Recommended Preparation: Engr 320/ME 322, Engr 335.

Course Learning Objectives

Students will:

- be familiar with the fundamentals of modern turbomachinery.
- be familiar with gas (combustion), steam, wind and hydraulic turbomachinery.
- be familiar with Applications of the principles of fluid mechanics, thermodynamics and aerodynamics to the design and analysis of turbomachines.

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!

Assignments and Homework Submission

Reading and homework assignments will be posted on the course website. Graduate students will be assigned additional homework problems that are more difficult than those assigned to undergraduate students. Homework assignments are due by 5pm on Monday posted on the course website. Homework not submitted by the due time is considered late and will receive a grade of zero. For ease of grading, and for consistency, each homework assignment must be submitted as follows,

- Print out the homework assignment sheet(s) from the course website on BbLearn and staple it on top of the completed homework assignment.
- Make sure your name and signature are filled in on the cover page.
- Use only 8 ½ × 11 inch paper. Engineering paper is preferred.
- Do not rip paper out of a spiral notebook unless you cut off all the messy fringes and frays.
- Staple all pages, including the cover page(s), together in the upper left hand corner (no folding please).
- Add page numbers and staple all pages in the right order!
- One problem per page is preferred, but short problems can be combined on one page. If so, draw a dark line between the problems to clearly separate them.
- State the problem briefly, show important solution points, and box your final answer!
- Electronic version of HW will NOT be accepted but you may print out the electronic version for submission.

Exams and Final Course Project

All three exams will be open book. However, only textbook and lecture notes will be allowed. No homework, homework solutions, or any other textbook/solution manual will be allowed to bring to the exams. It is also recommended to bring a formula sheet to write down key governing equations that you think are important. Different exams will be given to undergraduate and graduate students. 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 the 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, the Final Course Project in this course is open-ended problems. The problems can be either selected by the students related to their research or provided by the instructor if students cannot find an appropriate problem. The instructor will meet each student/team to discuss the objective, approach, and tasks and schedule for them to finish the project in time. A final presentation and/or report for the course project will be used as the final exam. For difference on the requirements of ME417 and ME517, please refer to Lecture 1.

Software

You may use Engineering Equation Solver (EES), MatLab, and/or Mathcad complete all the homework assignments. Note that the EES software is only available through VLAB or ME Lab computers and 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. For the final course project, you may use EES or any other software you are familiar with, including but not limited to, CFD (e.g. ANSYS FLUENT), Mathcad, and MATLAB, etc. A temporary license file of using Tecplot 360 2013R1 or Tecplot 360 EX 2016R2 may be provided to students for free during the final course project. Tecplot can be used for making vector plots, streamline plots, and contour plots.

Course Grading

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

Homework (Individual)	20%
Exam 1 (Individual)	15%
Exam 2 (Individual)	15%
Exam 3 (Individual)	15%
Final Course Project (team/individual)	25%
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.

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.*

Acts of academic dishonesty, including cheating or plagiarism are considered a very serious transgression and may result in a grade of F for the course. 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 Class Schedule is in the next page
(may be updated through the semester!!!)

Lec	Date	Day	Topic	Reading
	8-Jan	M		
1	10-Jan	W	Introduction I (syllabus, course description)	Syllabus and notes
2	12-Jan	F	Introduction II: Definition and Classification of turbomachines	
	15-Jan	M	MARTIN LUTHER KING DAY - UI CLOSED	
3	17-Jan	W	Introduction III: Impulse vs. reaction; velocity triangle	
4	19-Jan	F	A little history	
5	22-Jan	M	Fundamental laws & Concepts I	
6	24-Jan	W	Fundamental laws & Concepts II	
7	26-Jan	F	Fundamental laws & Concepts III	
8	29-Jan	M	Dimensional analysis for turbomachinery I	
9	31-Jan	W	Dimensional analysis for turbomachinery II	
10	2-Feb	F	Dimensional analysis for turbomachinery III	
11	5-Feb	M	Pumps and Pump Performance	
12	7-Feb	W	Pump Similitude and Cavitation	
13	9-Feb	F	Review for Exam 1	
	12-Feb	M	Exam 1	
14	14-Feb	W	Two-Dimensional Cascade I	
15	16-Feb	F	Two-Dimensional Cascade II	
	19-Feb	M	PRESIDENTS' DAY - UI CLOSED	
16	21-Feb	W	Two-Dimensional Cascade III	
17	23-Feb	F	Hydraulic Turbines I	
18	26-Feb	M	Hydraulic Turbines II	
19	28-Feb	W	Hydraulic Turbines III	
20	2-Mar	F	Hydraulic Turbines IV	
21	5-Mar	M	Hydraulic Turbines V and Wind Turbines I	
22	7-Mar	W	Wind Turbines II	
23	9-Mar	F	Wind Turbines III	
	12-Mar	M	Spring recess	
	14-Mar	W	Spring recess	
	16-Mar	F	Spring recess	
24	19-Mar	M	Wind Turbines IV	
25	21-Mar	W	Tour of University Energy Plant	
26	23-Mar	F	Hydraulic Pumps and Compressors I	
	26-Mar	M	Exam 2	
27	28-Mar	W	Hydraulic Pumps and Compressors II	
28	30-Mar	F	Hydraulic Pumps and Compressors III	
29	2-Apr	M	Hydraulic Pumps and Compressors IV	
30	4-Apr	W	Axial-Flow Turbines I	
31	6-Apr	F	Axial-Flow Turbines II	
32	9-Apr	M	Axial-Flow Turbines III	
33	11-Apr	W	Axial-Flow Turbines IV	
34	13-Apr	F	Axial-Flow Turbine V	
35	16-Apr	M	Axial-Flow Compressors I	
36	18-Apr	W	Axial-Flow Compressors II	
	20-Apr	F	Exam 3	
	23-Apr	M	In-class discussion of the final project	
	25-Apr	W	In-class discussion of the final project	
	27-Apr	F	In-class discussion of the final project	
	7-May	M	**Final Project Presentation 10am-12:00noon (JEB 221)**	