

ME-422-TURBOMACHINERY-SP2007.

Instructor: Dr. H. Perez-Blanco, 5-7842, hpb1@psu.edu

TA: Lakshmi Singh, lus157@psu.edu

Class: MWF 12:20-1:10 in 173 Willard

Optional Text: Cengel & Cimbala-“Fluid Mechanics Fundamentals and Applications”

Office Hours: Perez-Blanco: MW 5:00-4:00, Th 3:30-5:00/204 Reber

Singh: Fr 2:30-3:30/Place TBA

Course objectives

1. Review/acquire thermofluids concepts applicable to turbomachinery Reynolds transport theorem, First and Second laws, isentropic efficiencies, potential flow, boundary layer flow, turbulent flow and losses.
2. Develop an understanding of working principles applicable to centrifugal, axial machinery and extend to principles applicable to hydro and wind turbines, both for compressible and incompressible fluids.
3. Gain an understanding of loss calculations.

Coursework

1. Attending lectures and participating in class is required.
2. Materials: Take notes, or read from lectures <http://www.mne.psu.edu/me422/> (same material).
Use of text: Students are encouraged to read the text about the lecture topics if they find the lectures insufficient, or to broaden their knowledge. Also, the text is most useful to review basic concepts
3. Homework is assigned and due on Mondays. Friday's are quiz days, covering the week's material.
4. **Evaluation:** Homework: 20%, quiz 10%, exams: 30 % midterm, 40% final.

Grades:

A	A-	B+	B	B-	C+	C	D	F
100	94.99	89.99	84.99	79.99	74.99	69.99	64.99	54.99
95	90	85	80	75	70	65	55	0

Allowances: Students can drop 2 quizzes, one HMW and no exams. No make-up work will be given.

Schedule

DATES	# CLASS PERIODS	LECTURES	TOPICS
1/14	1	Introduction	Course structure. Turbomachines: from sump pumps to supersonic flight.
1/16 to 1/23	3	L7,L8	Similarity theory, Cordier diagram
1/25 to 2/1	4	L1	Basic principles:Euler transport theorem. Conservation Laws in integral form. Entropy generation, work loss and efficiency.
2/4 to 2/6	2	L2	Basic Energy Transactions in Turbomachines: Expansion, diffusion and energy extraction/addition.
2/8 to 2/11	2	L3 L3a	Torque and power
2/13 to 2/20	4	L4, L15	Compressible flow: axial turbine stage-losses.
2/22to 2/25	2	L16	Compressible flow: steam turbines
MIDTERM (TAKE HOME)			
2/27 to 3/7	5	L13	Compressible flow: Axial compressor stage-Losses
SPRING BREAK			
3/17 to 3/21	3	L10, L11	Compressible flow: Centrifugal compressors
3/24 to 3/28	3	L9	Incompressible flow:Centrifugal pumps/Cavitation
3/31 to 4/7	4	L18	Incompressible flow: Hydroturbines/efficiency
4/9 to 4/18	5	L16	Wind and axial hydraulic turbines: Aerodynamics and experience.
4/21 to 4/28	4	L19	Special topic: unsteady flows and turbomachines
4/30 to 5/2	2	Class notes	Inspection of Helicopter Gas Turbine-Review
FINAL (TAKE HOME)			