

AAE 4660

Aero Propulsion Systems

Syllabus - Fall 2009

Class Schedule

Lecture: MW 4:30-6:10PM, CEAS D206

Engine Runs: R 11:30-1:20PM

Office Hours: M 3:30-4:20PM, M 6:10-6:40PM

Instructor

William W. Liou, Ph.D.

CEAS G230

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http://www.mae.wmich.edu/faculty/liou/wp_general.htm

Guest Lecturer (Turbine Engine Control)¹

Sanjay Garg, Ph.D.

Branch Chief, Controls and Dynamics Branch

NASA Glenn Research Center, Cleveland, Ohio

<http://www.grc.nasa.gov/WWW/cdtb/personnel/sanjay.html>

<http://www.grc.nasa.gov/WWW/cdtb/index.html>

Text Book

Element of Gas Turbines and Rockets by J.D. Mattingly, AIAA Education Series 2006.

Course Description

Fundamentals of aeropropulsion systems will be introduced. Thermodynamics and fluid dynamics of aeronautical gas turbine engines components, including inlet, compressors, combustors, and turbines will be described. Analytical and computational techniques assisted by engine runs, will be used to design and determine the component's efficiencies.

Objectives

- To teach the students the thermodynamics and fluid dynamics of aeronautical gas turbine engine components, including inlet, compressor, combustor and turbine.
- To teach the students the analytical and computational techniques used in the design and the performance evaluation of turbine engine components.
- To apply engine performance evaluation techniques in gas turbine engine runs.

References

Aerothermodynamics of Gas Turbine and Rocket Propulsion, Revised and Enlarged, by G.C. Oates, AIAA Edu. Series, 1997.

Mechanics and Thermodynamics of Propulsion by Hill and Peterson, Addison-Wesley, 1970.

Fundamentals of Gas Turbine Engines by Bathie, John Wiley & Sons, 1984.

¹ Dr. Garg will lecture on fundamentals of gas turbine engine control on November 12, 2008 and give a seminar on "Research in Propulsion Control and Diagnostics."

Grading

Homework Assignments:	25%
Tests (two):	40%
Final Exam:	20%
Term Paper:	10%
Engine Runs:	5%

Tentative List of Subjects

1. Propulsion system introduction
2. Review of thermodynamics and fluid dynamics principles
3. Quasi-one-dimensional flows
4. Ideal cycle analysis
5. Component performance
6. Elementary of blade aerodynamics
7. Turbine engine sizing
8. Element of combustion
9. Turbine engine control
10. Test cell runs and simulations

Notes:

- (1) No make-up exams will be given for reasons other than documented medical emergencies. In any case, the students must inform the instructor prior to the test. The points for that test will be added to the final exam. If a student misses more than one test, the other test will be graded as zero.
- (2) Solve homework problems on engineering paper. Solve one problem on each page. All the assignments will be collected and graded. Hand in your paper before the class.
- (3) Late homework penalty: 30% for one day late, 60% for two days and no credit for more than two days late.
- (4) You are responsible for making yourself aware of and understanding the policies and procedures in the Undergraduate and Graduate Catalogs that pertain to Academic Honesty. These policies include cheating, fabrication, falsification and forgery, multiple submission, plagiarism, complicity and computer misuse. [The policies can be found at <http://catalog.wmich.edu> under Academic Policies, Student Rights and Responsibilities.] If there is reason to believe you have been involved in academic dishonesty, you will be referred to the Office of Student Conduct. You will be given the opportunity to review the charge(s). If you believe you are not responsible, you will have the opportunity for a hearing. You should consult with your instructor if you are uncertain about an issue of academic honesty prior to the submission of an assignment or test.
- (5) In class, beepers and cell phones alike should be turned off. Non-class-related uses of any PC platforms are discouraged. In exams, all electronic devices should be turned off.
- (6) Regarding H1N1 prevention measures, stay home when you show symptoms of flu <http://www.wmich.edu/flu/>. Contact the instructor immediately by phone or e-mail if you are ill and miss class. When necessary, class cancellation or postponement will be posted outside the classroom.