

AIRCRAFT PROPULSION

ASEN 5063

(Classroom – ECCS 1B28; Tuesdays and Thursdays 3:30 PM to 4:45 PM)

Course Description:

This course is designed to teach the principles and practice of modern aircraft propulsion. It builds on the principles taught in ASEN 4013 (Fundamentals of Aerospace Propulsion). Gas turbine engines, principally turbofans, form an overwhelming fraction of modern aircraft engines. So the focus will be on turbofans, especially for commercial aircraft, although turboprops and military turbofans will also be considered. The emphasis will be more on the current state of aircraft propulsion, how engine selections are made, and what is necessary for success in the highly competitive field of aircraft propulsion. We will start with a review of the current state of aircraft propulsion and a brief history of gas turbine engines. After a brief overview of the Brayton cycle and a review of the principles of gas turbine engines, we will deal with analysis and design of various components: centrifugal and axial compressors, axial and radial flow turbines, inlets and nozzles, and burners. Compressor-turbine matching will be discussed, followed by analysis of off-design performance of gas turbine engines. Finally, environmental aspects of modern gas turbine engines, noise and emissions, will be dealt with.

We will be following an extensive set of notes I have prepared over the years. These notes will be made available on D2L and will be supplemented by material from a recent textbook on *Aircraft Propulsion* by Farokhi, and a monograph on *Jet Propulsion* by Cum

4. Engine Selection
5. Brief Overview of Ideal and Real Cycle Analyses
6. Centrifugal and Axial Flow Compressors

book deals with design of aircraft engines, with a specific example of an engine for an advanced air-to-air fighter).

9. ***Aircraft Engines and Gas Turbines***, 2nd Edition, by J. L. Kerrebrock, MIT Press, 2001 (ISBN 0-262-11162-4). **Call # TL709.K46 1992** (A 6000 level book by the ex-director of the Gas Turbine Laboratory at MIT. Well-written and includes some other important aspects of aircraft engines such as engine noise and hypersonic engines).
10. ***Principles of Turbomachinery in Air-Breathing Engines***, E. A. Baskeharone. Cambridge University Press, 2006 (ISBN 978-0-521-85810-6). **Call # TJ778.B33 2006** (Good book on turbomachinery).
11. ***Aerospace Propulsion***, by T.-W. Lee, Wiley, 2014 (ISBN 978-1-118-30798-4) (An elementary treatment better suited for a 4000 level course).
12. ***Aircraft Propulsion***, by V. Babu, CRC Press, 2009 (ISBN 1-43981-271-3) (An elementary treatment).
13. ***Mechanics and Thermodynamics of Propulsion***, 2nd Edition, by P. Hill, and C. Peterson, Addison Wesley, 1992 (ISBN 0-201-14659-2). **Call # TL709.H5 1992** (A classic but dated. Remains a valuable resource on aerospace propulsion. It devotes about 1/3 each to fundamentals, air-breathing and rocket propulsion).
14. ***Gas Turbine Theory***, 4th Edition, by H. Cohen, GFC Rogers and HIH Sravanamutto, T. J. Press, 1996 (ISBN 0-582-23632-0). **Call # TL778.C6 1996** (Classic but somewhat dated).

Journals:

AIAA Journal of Propulsion and Power

AIAA Journal of Aircraft

AIAA Journal

ASME Journal of Engineering for Gas Turbines and Power

ASME Journal of Turbomachinery

Logistics:

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