

**AE 351 Compressible Flow**  
**Required Course offered Every Spring Semester**

**2005 Catalog Data:**        **Compressible Flow (3)** One-dimensional internal flow with shocks, friction, and non-adiabatic conditions. Two-dimensional external flows. Prerequisite: 341, ME 331.

**Textbooks:**                James E. A. John, Gas Dynamics, Second Edition, Allyn & Bacon

**Prerequisite by topic:**

1. Basic concepts in thermodynamics.
2. Basic concepts in incompressible flow

**Course Objectives:**

(Letters in brackets refer to the Educational Objectives of the Aerospace Engineering Program)

Objective 1: To assist the student in mastering the ability to apply fundamental principles of compressible flow in the analysis and design of nozzles, small wind tunnels, and flow passages through jet and rocket engines. [A, B, D]

Objective 2: To assist the student in mastering the ability to apply fundamental principles of compressible flow in the analysis and design of high speed wings and shapes. [A, B, D]

**Topics:**

1. Isentropic flow and wave propagation
2. Converging and converging-diverging nozzles
3. Oblique shocks
4. Prandtl-Meyer expansion
5. Flow with friction
6. Flow with heat transfer
7. Nozzle design
8. Linearized flows
9. Flow measurements

**Evaluation:**        1. Examinations, quizzes  
                          2. Homework / classroom participation  
                          3. Individual design project

**Performance criteria:**

(Numbers in brackets refer to the evaluation methods used to assess student performance)

Objective 1

- 1.1 Students will demonstrate the capability to analyze compressible flow for internal flows with isentropic, shocks, friction, and non adiabatic behavior [1, 2, 3]
- 1.2 Students will demonstrate an understanding of the design process by using synthesis and analysis to establish suitable and acceptable designs for topics of 1.1 above [1, 2, 3]

Objective 2

- 2.1 Students will demonstrate the ability to analyze compressible flow for external flow over high speed wings and shapes. [1, 2]
- 2.2 Students will demonstrate an understanding of the design process by using synthesis and analysis to establish suitable and acceptable designs. [1, 2, 3]

**Class/Laboratory schedule:** 3 one hour lecture sessions per week

**Relation of course to program objectives:**

The educational objectives are expressed in terms of the program outcomes. This course covers the following outcomes:

AE a, c, e, g, i, k, l

ME a, c, e, g, i, k

Course Coordinator: M. W. Milligan, Professor  
Prepared By: Bond, Lyne, Johnson, Milligan

Revised: January 2005