

# Aerodynamics 3

Syllabus Number

2A311

Special Subjects

Elective 2 credit

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## 1. Course Description

Students learn following contents in this class.

1. Compressible fluid : change of density, sound velocity and Mach number, subsonic flow and supersonic flow, thermodynamics

2. One-dimensional flow : basic equation, sound wave, energy equation of adiabatic flow, isentropic flow

3. Normal shock wave : Rankine-Hugoniot equation

4. Oblique shock wave : shock angle

Students can acquire knowledge about DP2 in this class.

## 2. Course Objectives

Goal of this class is that students comprehend basic phenomenon and basic laws about compressible flow which influences high speed airplane or inner flow of jet engine etc. Moreover, student can study shock wave caused by supersonic flow.

## 3. Grading Policy

Attendance more than two thirds, midterm exam (40%) and term end exam (60%).

The students will get simple explanations after these exams.

## 4. Textbook and Reference

Reference

ISBN978-4274069697

ISBN978-4990748333

ISBN978-4621089705

ISBN978-4339046533

## 5. Requirements(Assignments)

Review incompressible fluid dynamics, thermodynamics, elementary dynamics, infinitesimal calculus and differential equation thoroughly.

Read the text within the contents of the next lecture and write in a notebook for preparation in order to comprehend meaning of technical terms (1.5 hours).

After the lecture will be ended, review the notebook teacher explains in the class (1.5 hours).

## 6. Note

## 7. Schedule

- |      |  |                                  |
|------|--|----------------------------------|
| [1]  | Introduction of compressible flow and thermodynamics (1) | : compressible flow              |
| [2]  | Introduction of compressible flow and thermodynamics (2) | : sound velocity and Mach number |
| [3]  | Introduction of compressible flow and thermodynamics (3) | : equation of state              |
| [4]  | Introduction of compressible flow and thermodynamics (4) | : first law of thermodynamics    |
| [5]  | Introduction of compressible flow and thermodynamics (5) | : entropy and enthalpy           |
| [6]  | One-dimensional flow (1)                                 | : basic equation                 |
| [7]  | One-dimensional flow (2)                                 | : sound wave, sound velocity     |
| [8]  | Summary of the former part, Midterm exam                 |                                  |
| [9]  | One-dimensional flow (3)                                 | : isentropic flow                |
| [10] | One-dimensional flow (4)                                 | : nozzle theory                  |
| [11] | Shock theory (1)   | : normal shock wave 1            |
| [12] | Shock theory (2)   | : Rankine-Hugoniot equation      |
| [13] | Shock theory (3)   | : normal shock wave 2            |
| [14] | Shock theory (4)   | : oblique shock wave             |
| [15] | Summary, Term end exam                                   |                                  |