Graduate Special Subject
Spring 2016
16.S198 Compressible Internal Flow
Units: 3-0-3, G-Level
Prerequisites: 2.25 or permission of instructor
Schedule: TR8:30-10 AM, Rm 33-206

This subject, formerly taught as 16.120 “Compressible Internal Flow and Aeroacoustics”, constitutes half of 16.120. Subject 16.S198 will be given during the first half of the spring semester.

16.S198 is not a conventional compressible flow course. The perspective and selection of material are from the point of view of someone interested in propulsion and fluid machinery. The perspective and material selection also reflect the fact that computational procedures for compressible flow are now widely used tools for the analysis of fluid motion. In this context the subject is aimed at developing, in a user-accessible manner, the physical principles that govern the behavior and performance of compressible channel flows and applying these principles to situations of practical interest. It will also be seen that such application can enable in-depth insight into the large amount of flow field information given by computational simulations, i.e., in enabling one not only to see what has happened in a given situation but also to understand why it has happened, and thus what the implications are, from a wider perspective.

The compressible internal flow part of the course is configured in learning modules in which the focus is (broadly) on one class of compressible flow phenomena, effects, or approaches to problem analysis. The phenomenon of choking in a compressible flow is an example of the first of these; the effects of swirl, stagnation pressure or temperature non-uniformity, fluid friction, and heat transfer are examples of the second. Control volume analysis is an example of the third. The observation is that this organization is necessary to provide an appropriate level of depth as well as some useful flexibility in the rate of topic coverage. However, compressible internal flows are not neatly packaged in accord with chapters in a text, and it is planned that there are places in which we address two or more phenomena together so their combined effect can be seen in technologically interesting environments.

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