High Speed Aerodynamics

Swayam Prabha Course Code – M79

PROFESSOR'S NAME	Dr. K.P. Sinhamahapatra
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COURSE OUTLINE	The course is designed as a core course for the undergraduate students of Aerospace engineering and contains the basic material essential for a foundation of compressible flow aerodynamics. The course introduces the fundamental concepts and principles of compressible flow and intends to provide the necessary background for advanced studies on the subject. A number of application problems are incorporated to illustrate the concepts. The course covers the general principles and essentials of compressible flow, the flow equations, one-dimensional gas dynamics, wave motion and waves in supersonic flow, flow in ducts, small-perturbation theory, method of characteristics and similarity rules. The exercises included in the course are intended to demonstrate the use of the course material and to outline additional equations and results. Even though the course is prepared mainly for the use of undergraduate students in aerospace engineering, it will also be useful to graduate students, teachers and practicing engineers and scientists.

COURSE DETAILS

S. No	Module ID/ Lecture ID	Lecture Title/Topic
1.	M1_L1	Introduction and Review of Thermodynamics
2.	M1_L2	Review of Thermodynamics (Contd.)
3.	M1_L3	Review of Thermodynamics (Contd.)
4.	M1_L4	Review of Thermodynamics (Contd.)
5.	M2_L5	One-Dimensional Gas Dynamics
6.	M2_L6	One-Dimensional Gas Dynamics (Contd.)

7.	**M2_L7**	One-Dimensional Gas Dynamics (Contd.)
8.	**M3_L8**	One-Dimensional Waves
9.	**M3_L9**	One-Dimensional Waves (Contd.)
10.	**M3_L10**	One-Dimensional Waves (Contd.)
11.	**M4_L11**	Waves and Supersonic Flow
12.	**M4_L12**	Waves and Supersonic Flow (Contd.)
13.	**M4_L13**	Waves and Supersonic Flow (Contd.)
14.	**M4_L14**	Waves and Supersonic Flow (Contd.)
15.	**M5_L15**	Shock Expansion Theory
16.	**M6_L16**	Flow through Ducts and Channels
17.	**M6_L17**	Flow in Ducts
18.	**M6_L18**	Flow in Ducts (Contd.)
19.	**M7_L19**	Adiabatic Flow in Ducts with Friction
20.	**M7_L20**	Adiabatic flow in Ducts with Friction (Contd.)
21.	**M8_L21**	Isothermal flow in Ducts with Friction
22.	**M9_L22**	Flow in Uniform Duct with Heating
23.	**M10_L23**	Multi - Dimensional Flow Problems
24.	**M10_L24**	Multi - Dimensional Flow Problems (Contd.)
25.	**M11_L25**	Linearized flow problems
26.	**M11_L26**	Linearized Flow Problems (Contd.)
27.	**M11_L27**	Linearized Flow Problems (Contd.)
28.	**M11_L28**	Linearized Flow Problems (Contd.)
29.	**M11_L29**	Linearized Flow Problems (Contd.)
30.	**M11_L30**	Linearized flow problems (Contd.)
31.	**M11_L31**	Linearized Flow PSroblems (Contd.)
32.	**M12_L32**	Linearized Problems - Forces on Slender Bodies
33.	**M12_L33**	Linearized Problems - Forces on Slender Bodies (Contd.)
34.	**M13_L34**	Similarity Rules for High Speed Flows

35.	**M13_L35**	Similarity Rules for High Speed Flows (Contd.)
36.	**M13_L36**	Similarity Rules for High Speed Flows (Contd.)
37.	**M14_L37**	Similarity Rules in Hypersonic Flow
38.	**M15_L38**	Transonic Flow
39.	**M15_L39**	Transonic Flow (Contd.)
40.	**M15_L40**	Transonic Flow (Contd.)

List of reference material/ books:

A H Shapiro, Dynamics and Thermodynamics of Compressible Fluid Flow-Volume I& II, Ronald Press.

H W Liepmann and A Roshko,Elements of Gas Dynamics, John Wiley & Sons.

J D Anderson, Jr., Modern Compressible Aerodynamics, McGraw-Hill International.

Name and contact details of two referees for the course: