



National Institute of Technology Meghalaya
An Institute of National Importance

CURRICULUM

Programme	Bachelor of Technology in Mechanical Engineering	Year of Regulation	2018
Department	Mechanical Engineering	Semester	VI

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total

ME 324	Gas Dynamics	3	0	0	3	50	50	100	200	
Course Objectives	To understand the concept of compressible fluid flow	Course Outcomes	CO1	Outline governing equations and thermodynamic relationships of fluid flow.						
	To know effects of shocks, compression and expansions.		CO2	Illustrate various concepts of compressible flow						
	To be able to calculate changes to flows across shocks/expansions.		CO3	Analyse compressible flow conditions in various geometries with isentropic conditions						
	To know various experimental and characterisation systems in compressible flow		CO4	Analyse various non-isentropic flow conditions						
CO5			Illustrate experimental methodology and characterisation in compressible flow physics.							

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs			
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
1	CO1	3	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
2	CO2	3	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
3	CO3	3	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
4	CO4	3	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
5	CO5	0	0	0	2	0	0	0	0	0	0	0	0	0	2	0	0

SYLLABUS

No.	Content	Hours	COs
1	Review of Fundamentals: Concepts from Fluid Mechanics, Laws for Perfect gases, Basic Thermodynamic Relations	05	CO1
2	Compressible flow: Concept of Waves in fluid, Mach waves, Compression waves, Expansion waves, Mach number, Pressure field	8	CO2
3	Isentropic flow: Shock waves, Stationary and Moving Shocks, Oblique Shocks, Bow Shocks, Expansion Fans, Flow around bodies, Shock expansion method for flow over aerofoils, Flow Through a nozzle: Convergent Nozzles, CD Nozzles, Exit Pressure variation vs. Stagnation pressure variation, Oblique shock wave reflections, Jet flows Under- and over-expanded flows Shear layers	10	CO3
4	Non-isentropic flows: Flow with Friction, Friction choking, Flow with heat addition, Thermal choking, Supersonic combustion	05	CO4
5	Experimental Methods: Shock Tube, Supersonic Wind tunnel, Flow visualization, Supersonic Probes, Methods of characteristics, Design of nozzles, External flow around bodies, Experimental characteristics of aerofoils in compressible flow, Unsteady flows.	08	CO5
Total Hours		36	

Essential Readings

1. J. D. Anderson, "Modern Compressible Flow", McGraw Hill
2. R. D. Zucker and O. Biblarz, "Fundamentals of Gas Dynamics", Wiley
3. P.H.Oosthuizen, and W. E. Carscallen, "Compressible Fluid Flow", McGraw-Hill

Supplementary Readings

1. H. W. Liepmann and A. Roshko, "Elements of Gas Dynamics", John Wiley
2. V. Babu, "Fundamentals of Gas Dynamics", Ane Books
3. R. D. Zucker and O. Biblarz, "Fundamentals of Gas Dynamics", Wiley