



National Institute of Technology Meghalaya
An Institute of National Importance

CURRICULUM

Programme	Master of Technology in Mechanical Engineering	Year of Regulation	2018
Department	Mechanical Engineering	Semester	I

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
ME 513	Aerodynamics	3	0	0	3	50	50	100	200
Course Objectives	To introduce the concept of inviscid, incompressible and compressible flows	Course Outcomes	CO1	Illustrate the basic concepts of aerodynamics					
	To teach various concepts of fluid mechanics for application in aerodynamics		CO2	Analyze and evaluate systems associated with potential flow					
	To develop an ability and skill to design an aerodynamics system		CO3	Analyse and apply the concepts of fluid mechanics for flow over airfoil					
	To develop an ability to analyse various fluid flow system in terms of the aerodynamics structure		CO4	Analyse and apply the concepts of fluid mechanics for flow past finite wings					
			CO5	Understand the concepts of gas dynamics					

SYLLABUS

No.	Content	Hours	COs
I	Introduction Importance of aerodynamics, Classification, Aerodynamic forces and moments, Buoyancy force, Types of flow, Boundary layer, the aerodynamic coefficients.	05	CO1
II	Review of Fluid Mechanics Differential and integral forms of conservation equations: continuity, momentum and energy equation, Substantial derivative, Pathlines, Streamlines, Streaklines, Circulation.	05	CO1
III	Potential flow Introduction to vorticity and circulation, concept of velocity potential and stream function, Flow singularities and their superposition, lifting and non-lifting flows, Stokes, Helmholtz's theorems, Blasius integral theorem, Kelvin's circulation theorem, Kutta-Joukowski's theorem.	08	CO2
IV	Flow past airfoils Kutta condition, standard airfoils and their nomenclature, thin airfoil theory for symmetrical airfoils: lifting and non-lifting cases, thin airfoil theory for cambered airfoils.	06	CO3
V	Flow past finite wings Down wash and Induced drag, Horse-shoe vortex, Biot-Savartlaw, Elliptic and non-elliptic wings, 3D Ground effect, down wash on tail plane, Effect of Sweep back, Delta wings in incompressible flows.	06	CO4
VI	Inviscid compressible flow Normal and oblique shocks, expansion waves, supersonic wind tunnels, elements of hypersonic flow, Newtonian theory, equation of viscous flow, laminar and turbulent boundary layers	06	CO5
Total Hours		36	

Text Books and References

10. J. D. Anderson Jr., "Fundamentals of Aerodynamics", McGraw Hill
11. J. J. Bertin, "Aerodynamics for Engineers", Pearson Education
12. L. J. Clancy, "Aerodynamics", Himalayan Books

Supplementary Readings

1. W. L. Houghton and N. B. Caruuthers, Aerodynamics for Engineering Students, Arnold Publication
2. A. M. Kuethe and C-Y Chow, "Foundation of Aerodynamics", Willey.