L	T	P	Credit	Area		CWS	PRS	MTE	ETE	PRE
3	0/1	2/0	4	DEC/GEC		15/25	25	20/25	40/50	-

Objective: To enable the students to understand the introduction to CFD, mathematical behavior of partial differential equations. To understand concept of commercial codes (e.g. FLUENT).

Syllabus		Contact Hours
Unit-1	Introduction to CFD, Historical background, Impact of CFD	6
Unit-2	The Governing Equations of Fluid Dynamics Derivation, Discussion of physical meanings and Presentation of forms particularly suitable to CFD.	8
Unit-3	Mathematical Behavior of Partial Differential Equations: Impact on CFD	6
Unit-4	Basic Aspects of Discretization: Introduction to Finite Difference, Finite Elements and Finite Volume Methods. Detailed treatment of Finite Difference method, explicit and implicit methods, errors and stability analysis.	8
Unit-5	Grids with Appropriate Transformations Adaptive grids and unstructured meshes. Lift reduction, down force generation and drag reduction. An introduction to the aerodynamics of airflows for cooling.	8
Unit-6	Commercial codes (e.g. FLUENT etc.). Grid generation, techniques and application. Basic principles and concepts and the characteristics of wings and diffusers	6
		42

Reference Book:	
1	Computational Fluid Dynamics",John Anderson," McGraw- Hill Ltd.
2	Computational Fluid Dynamics",Tu, Elsevier.
3	Introduction to Computational Fluid Dynamics,Niyogi, Pearson Education, Delhi

Course Outcomes

CO1	Optimization manufacturing of hvac design, aerodynamics design, automobiles design, external building flows, fire/smoke management.
CO2	CFD analysis of velocity, pressure, temperature and chemical concentration allocation etc. helps engineers in understanding the problem appropriately and offers practical ideas for the best decision about the most flawless and productive designing.
CO3	CFD save cost and time, CFD is reliable.
CO4	Basics of Finite Difference, Finite Elements and Finite Volume Methods.
CO5	Grids with Appropriate Transformations Adaptive grids
CO6	Able to use commercial codes and software's

CO-PO/PSO Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	0	0	0	0	0	0	2	2	1	1
CO2	3	3	2	3	1	0	0	0	0	0	0	1	2	1	1
CO3	3	3	3	3	1	0	0	0	0	0	0	2	3	3	2
CO4	3	3	3	3	1	0	0	0	0	0	0	1	3	3	2
CO5	2	2	2	2	2	0	0	0	0	0	0	1	2	2	2
CO6	3	3	3	2	2	0	0	0	0	0	0	2	2	1	1

ME363 Finite Element Methods