

MM 546 Viscous Flows				MECHANICAL ENGINEERING DEPARTMENT					
Semester	Methods of Education							Credits	
	Lecture	Recit.	Lab.	Project/Field Study	Homework	Other	Total	Credit	ECTS credit
1,2	24	18				146	188	3	7.5
Language	Turkish								
Compulsory / Elective	Optional								
Prerequisites	-								
Course Contents	The basic equations; Derivation of the continuity equation, derivation of the equation of motion of a compressible viscous fluid. Derivation of the energy equation. Exact solutions of the Navier-Stokes equations; Couette flow, Poiseuille flow, the flow between two concentric rotating cylinders, Stoke's first problem, Stoke's second problem, stagnation flow, flow near a rotating disc, flow in convergent and divergent channels. Laminar boundary layers; derivation of boundary layer equations, flow past a wedge, flow in a convergent channel, derivation of Von-Karman's integral equations, flow past a flat plate, flow past a circular cylinder. Thermal boundary layer in laminar flow; boundary layer simplifications, Couette flow Poiseuille flow, effect of Prandtl number. Fundamentals of turbulent flow.								
Course Objectives	To derive basic equations which are governing viscous fluid flow. To teach and apply basic analytical methods employed for solution of these equations. To solve engineering problems by simplifying governing equations..								
Learning Outcomes and Competences	Understanding of the basic characteristics of viscous fluid motion. Learning and applications of methods used to the solution of viscous flow problems. Interpret the results of solved problems.								
Textbook and /or Reference	1. Currie, I. G. Fundamental Mechanics of Fluids. McGraw-Hill Book Company. 2. White, F. M. Viscous Fluid Flow. McGraw-Hill Book Company. 3. Schlichting, H. Boundary Layer Theory. McGraw-Hill Book Company.								
Assessment Criteria					If any, mark as (X)		Percentage (%)		
	Midterm Exams				X		40		
	Quizzes								
	Homeworks								
	Projects								
	Term Paper								
	Laboratory Work								
	Other								
	Final Exam				X		60		
Instructors	Prof. Nuri YUCEL								
Week	Subject								
1	Fundamentals principles								
2	Boundary layer theory								
3	Basic equations of boundary layer; continuity and momentum equations								
4	Energy equation								
5	Exact solutions of the Navier-Stokes equations								
6	Flow between two rotating cylinders, Stoke's 1 and 2nd problems								
7	1st Midterm examination								
8	Two dimensional boundary layer over a plate								
9	Integral and similarity solution of the momentum and energy equations								
10	Thermal boundary layer in laminar flow								
11	Natural boundary layer; integral solution								
12	Natural boundary layer; similarity								
13	2nd Midterm examination								
14	Effect of thermal stratification								