

VISCOUS FLOWS

1	Course Title:	VISCOUS FLOWS	
2	Course Code:	MAK5229	
3	Type of Course:	Optional	
4	Level of Course:	Second Cycle	
5	Year of Study:	1	
6	Semester:	1	
7	ECTS Credits Allocated:	6.00	
8	Theoretical (hour/week):	3.00	
9	Practice (hour/week):	0.00	
10	Laboratory (hour/week):	0	
11	Prerequisites:	No	
12	Language:	Turkish	
13	Mode of Delivery:	Face to face	
14	Course Coordinator:	Prof. Dr. İRFAN KARAGÖZ	
15	Course Lecturers:	Prof.Dr. İrfan Karagöz	
16	Contact information of the Course Coordinator:	karagoz@uludag.edu.tr 40018	
17	Website:		
18	Objective of the Course:	This course is designed to introduce the students to the properties and behavior of fluids, to explain the governing equations in different coordinate systems, to give analytical solution of the governing equations for practical fluid flow problems and to introduce the basic concepts of boundary layers and turbulent flows.	
19	Contribution of the Course to Professional Development:	Gives the ability to model, solve and analyze viscous flow phenomena	
20	Learning Outcomes:		
		1	Be able to explain fluid properties and basic flow phenomena.
		2	Ability to describe fluid systems
		3	Ability to develop an understanding of the physical laws and basic equations governing fluid mechanics
		4	Ability to simplify generalized conservation equations for application to specific flow problems.
		5	Ability to describe boundary and initial conditions for solution of the governing equations
		6	ability to solve and analyze the mathematical model associated with a physical fluid-flow system
		7	ability to solve error analyze for numerical solution
		8	Be able to recognize the flow regimes and their characteristics
		9	
		10	
21	Course Content:		
		Course Content:	
Week	Theoretical	Practice	
1	Introduction, definition of fluid properties and basic flow phenomena		

2	Eulerian vs. Lagrangian frame of reference, substantial derivative, fluid kinematics	
3	Derivation of the conservation equations in Cartesian coordinates	
4	Derivation of the conservation equations in Cartesian coordinates	
5	Stress tensor, Constitutive equations	
6	The Navier-Stokes equations in Cartesian coordinates	
7	Derivation of the conservation equations in Curvilinear coordinate systems	
8	Non-dimensional forms of the equations	
9	Exact solutions of the Navier-Stokes equations in Cartesian coordinates	
10	Exact solutions of the Navier-Stokes equations in Curvilinear coordinates.	
11	Solutions of the Navier-Stokes equations for unsteady flows	
12	Basic description, characteristics, and concepts of turbulent flow	
13	Boundary layers, separation, transition.	
14	Laminar and turbulent boundary layers.	
22	Textbooks, References and/or Other Materials:	1) Viscous Fluid Flow , White, F.M. , 3th Edition, Mc Graw-Hill, 2005 2) Viscous Flow , Sherman, F. S. , Mc Graw-Hill, 1990. 3) Transport Phenomena, 2nd Edition, Bird R.B., Stewart W.E., Lightfoot E.N., John Wiley, 2006
23	Assesment	
TERM LEARNING ACTIVITIES		NUMBER
		WEIGHT
Midterm Exam		0
Quiz		0
Home work-project		3
Final Exam		1
Total		4
Contribution of Term (Year) Learning Activities to Success Grade		30.00
Contribution of Final Exam to Success Grade		70.00
Total		100.00
Measurement and Evaluation Techniques Used in the Course		Classical exams
24	ECTS / WORK LOAD TABLE	

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	3.00	42.00
Practicals/Labs	0	0.00	0.00
Self study and preperation	10	6.00	60.00
Homeworks	3	16.00	48.00
Projects	0	0.00	0.00
Field Studies	0	0.00	0.00
Midterm exams	0	0.00	0.00
Others	0	0.00	0.00
Final Exams	1	30.00	30.00
Total Work Load			180.00
Total work load/ 30 hr			6.00
ECTS Credit of the Course			6.00

25	CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS															
	PQ1	PQ2	PQ3	PQ4	PQ5	PQ6	PQ7	PQ8	PQ9	PQ10	PQ11	PQ12	PQ13	PQ14	PQ15	PQ16
ÖK1	3	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0
ÖK2	2	4	0	0	0	0	0	0	0	3	0	0	0	0	0	0
ÖK3	3	4	0	0	0	0	0	0	0	2	0	0	0	0	0	0
ÖK4	3	4	0	0	0	0	0	0	0	2	0	0	0	0	0	0
ÖK5	3	5	0	1	0	0	0	0	0	2	0	0	0	0	0	0
ÖK6	4	3	0	1	0	0	0	0	0	2	0	0	0	0	0	0
ÖK7	3	3	0	1	0	0	0	0	0	2	0	0	0	0	0	0
ÖK8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LO: Learning Objectives PQ: Program Qualifications																
Contribution Level:	1 very low			2 low			3 Medium			4 High			5 Very High			