IM 419 WATERHAMMER		CIVIL ENGINEERING	
Semester	**Credit Structure**		
	Lecture	**Recitation**	**Laboratory**
7 or 8	3	0	0
Language	Turkish		
Compulsory / Elective	Elective		
Prerequisites	-		
Catalog Description	Rigid water column theory, elastic water column theory, dynamic equilibrium and analytical solution, governing equations of waterhammer, velocity of waterhammer in different material-pipes, waterhammer wave reflection in branching pipes, graphical solution with energy losses, solution methods for waterhammer, methods of prevention of waterhammer, surge tanks, gas-tanks		
Course Objectives	To give the basic principles of waterhammer		
Course Outcomes	Gaining the skill of handling, formulating and solving the problems related to waterhammer.		
Textbook and /or References	1-Parmakian, J., 'Waterhammer Analysis', Dover Publications Inc., New York, 1963. 2-Wylie, E.B., and Streeter, V.L., 'Fluid Transients', Prentice Hall Inc., New York, 1978.		
Assessment Criteria		**Quantity**	**Percentage**
	Midterm Exams	2	50
	Quizzes		
	Homeworks		
	Projects		
	Term Paper		
	Laboratory Work		
	Other		
	Final Exam	1	50
Course Category by Content (%)	**Mathematics and Basic Sciences**		50
	Engineering Science		40
	Engineering Design		10
	Social Sciences		
Instructors	Prof.Dr. İbrahim GÜRER		

COURSE PLAN	
Week	**Topics**
1	Rigid and elastic water column theories
2	Dynamic equilibrium and analytical solution
3	Equivalent-pipe method
4	Governing equations of waterhammer
5	Governing equations of waterhammer
6	Velocity of waterhammer wave
7	Mid-Term Exam I
8	Case in pipes made of different materials
9	Reflection of waterhammer waves in branching pipes
10	Reflection of waterhammer waves in branching pipes
11	Graphical solution in case of energy losses
12	Mid-Term Exam II
13	Methods for prevention of waterhammer
14	Surge tanks, gas tanks

RELATIONSHIP BETWEEN THE COURSE AND DEPARTMENT CURRICULUM				
	Program Outcomes	**1**	**2**	**3**
1	An ability to apply knowledge of mathematics, science, and engineering			X
2	An ability to design and conduct experiments, as well as to analyze and interpret data		X	
3	An ability to design a system, component, or process to meet desired needs		X	
4	An ability to function on multi-disciplinary teams		X	
5	An ability to identify, formulate, and solve engineering problems			X
6	An understanding of professional and ethical responsibility		X	
7	An ability for effective written and oral communication in Turkish and English		X	
8	The broad education necessary to understand the impact of engineering solutions in a global and societal context			X
9	A recognition of the need for, and ability to engage in life-long learning		X	
10	A knowledge of contemporary issues			X
11	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice		X	
	Contribution of the course : 1:None 2:Partially 3:Completely			