T.C. ESKİŞEHİR OSMANGAZİ UNIVERSITY
ARCHITECTURE AND ENGINEERING FACULTY
MECHANICAL ENGINEERING DEPARTMENT

COURSE INFORMATION FORM

		SEMESTER	**FALL**
COURSE CODE	**151818469**	**COURSE NAME**	**GAS DYNAMICS**

SEMESTER	**WEEKLY COURSE PERIOD**			**COURSE OF**			
	Theory	**Practice**	**Laboratory**	**Credit**	**ECTS**	**TYPE**	**LANGUAGE**
7	**3**	0	0	**3**	**5**	COMPULSORY ( ) ELECTIVE (X)	**ENGLISH**

COURSE CATAGORY			
Basic Science	**Basic Engineering**	**Mechanical Engineering** **[if it contains considerable design, mark with (√)]**	**Social Science**
	X	( )	

ASSESSMENT CRITERIA			
	Evaluation Type	**Quantity**	**%**
MID-TERM	Mid-Term	1	**40**
	Quiz		
	Homework		
	Project		
	Report		
	Others (……)		
FINAL EXAM		1	**60**

PREREQUIEITE(S)	
COURSE DESCRIPTION	Introduction to compressible flow; speed of sound, Mach number. One-dimensional Isentropic flow. Isentropic operation of nozzles. Performance of real nozzles. Thrust of a rocket engine. Normal shock waves. Moving normal shock waves. Non-isentropic flow regime in converging-diverging nozzles. Non-isentropic operation of supersonic diffusers, performance of real diffusers. One-dimensional unsteady flow in a shock tube. Frictional flow in constant-area ducts. Flow in constant-area ducts with heat transfer. Steady and two-dimensional supersonic flows.
COURSE OBJECTIVES	To give students basic knowledge about; main principles of gas dynamics and their application, importance of speed of sound and Mach number, one-dimensional isentropic flow, operation and performance of nozzles , thrust of a rocket engine, standing and moving normal shock waves, non-isentropic flow regime in converging-diverging nozzles, non-isentropic operation and performance of supersonic diffusers, unsteady flow in a shock tube, flow in constant-area ducts with friction and heat transfer, steady and two-dimensional supersonic flows and the main elements used in these flows, their analyses, detailed descriptions, losses and efficiencies.
ADDITIVE OF COURSE TO APPLY PROFESSIONAL EDUATION	After taking up the course, the students will be capable to analyse, understand the operation and performance of nozzles, rocket engine, normal shock waves, supersonic diffusers, flow in a shock tube, flow in constant-area ducts with friction and heat transfer, steady and two-dimensional supersonic flows, losses, efficiencies; and also follow and understand the new developments in these areas, and put their skills in practice in the field of technology in industry.
COURSE OUTCOMES	1. Knows the basic principles of gas dynamics. 2. Comprehends the speed of sound, Mach number, isentropic flow and the characteristic speeds of gas dynamics. 3. Gains the capability of using working chart and working table for isentropic flow. 4. Applies the governing equations and the relations for isentropic flow of an ideal gas. 5. Determines the efficiency of nozzles, rocket engines and diffusers.
TEXTBOOK	Mehmet Haluk Aksel and Osman Cahit Eralp, **" GAS DYNAMICS "**, Prentice Hall International (UK) Ltd, 1994.
OTHER REFERENCES	John David Anderson, Jr., **" Modern Compressible Flow with Historical Perspective "** , Second Edition, McGraw-Hill Inc., New York, 1990.
TOOLS AND EQUIPMENTS REQUIRED	

COURSE SYLLABUS	
WEEK	**TOPICS**
1	Compressible flow; speed of sound, Mach number. Isentropic flow; governing equations, stagnation conditions.
2	Characteristic speeds of gas dynamics, effects of area variation on flow properties in isentropic flow.
3	Relations for the isentropic flow of a perfect gas, working chart and working table for isentropic flow.
4	Isentropic operation of nozzles, performance of real nozzles.
5	Thrust of a rocket engine.
6	Normal shock waves; governing equations for the flow across a normal shock wave, relations for the flow of a perfect gas across a normal shock wave.
7	Moving normal shock waves, reflected normal shock waves, non-isentropic flow regime in converging-diverging nozzles.
8	Term Examination
9	Term Examination
10	Non-isentropic operation of supersonic diffusers, performance of real diffusers.
11	One-dimensional unsteady flow in a shock tube.
12	Frictional flow in constant-area ducts.
13	Flow in constant-area ducts with heat transfer.
14	Steady and two-dimensional supersonic flows.
15,16	Final Exam

NO	PROGRAM OUTCOMES	3	2	1
1	Sufficient knowledge of engineering subjects related with mathematics, science and own branch; an ability to apply theoretical and practical knowledge on solving and modeling of engineering problems.	**X**		
2	Ability to determine, define, formulate and solve complex engineering problems; for that purpose an ability to select and use convenient analytical and experimental methods.	**X**		
3	Ability to design a complex system, a component and/or an engineering process under real life constrains or conditions, defined by environmental, economical and political problems; for that purpose an ability to apply modern design methods.			**X**
4	Ability to develop, select and use modern methods and tools required for engineering applications; ability to effective use of information technologies.			**X**
5	In order to investigate engineering problems; ability to set up and conduct experiments and ability to analyze and interpretation of experimental results.		**X**	
6	Ability to work effectively in inner or multi-disciplinary teams; proficiency of interdependence.		**X**	
7	Ability to communicate in written and oral forms in Turkish/English; proficiency at least one foreign language.		**X**	
8	Awareness of life-long learning; ability to reach information; follow developments in science and technology and continuous self-improvement.	**X**		
9	Understanding of professional and ethical issues and taking responsibility	**X**		
10	Awareness of project, risk and change management; awareness of entrepreneurship, innovativeness and sustainable development.			**X**
11	Knowledge of actual problems and effects of engineering applications on health, environment and security in global and social scale; an awareness of juridical results of engineering solutions.			**X**
1:None. **2**:Partially contribution. **3**: Completely contribution.				

Prepared by: **Prof. Dr. Tahir KARASU, D.I.C** **Date:** 15.04.2013

Signature(s):