

INTERNAL COMBUSTION ENGINES

1	Course Title:	INTERNAL COMBUSTION ENGINES
2	Course Code:	OTO5131
3	Type of Course:	Optional
4	Level of Course:	Third 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:	None
12	Language:	Turkish
13	Mode of Delivery:	Face to face
14	Course Coordinator:	Prof. Dr. ALİ SÜRME
15	Course Lecturers:	Yok
16	Contact information of the Course Coordinator:	surmen@uludag.edu.tr +90 (224) 294 1965 Mühendislik Fakültesi Otomotiv Mühendisliği Bölümü
17	Website:	
18	Objective of the Course:	<p>The main goals of the course are to provide the students with fundamental knowledge of internal combustion engines, as they are the most common member of power-producing machines throughout the world, the most impressive machine in the civilised world and the machine which includes highest number of engineering disciplines in its structure and operation</p> <p>The main objectives of the course are</p> <ol style="list-style-type: none"> 1. To have the students capable of clearly distinguishing the place of internal combustion engines in the family of engines 2. To have them able to classify the ICEs and know operational principles of each 3. To perform the performance analysis and limits of ICEs and become capable of solving any type of related problem. 4. To have some basic knowledge of the supplementary systems of the ICEs, as they are inevitably important for highest available performance from engine.
19	Contribution of the Course to Professional Development:	<p>Students know the difference between engines in terms of different engineering principles.</p> <p>Students know the working principles of different engines.</p> <p>Students comprehend the kinematics and motion principles of internal combustion piston engines.</p> <p>Students can make a full thermodynamic analysis of an internal combustion engine.</p> <p>Students can model an engine cycle.</p> <p>Students comprehend all performance parameters of an engine, the relationship between them and how they affect engine performance.</p> <p>Students comprehend engine characteristics, fuel properties, operating parameters and the relationship between them that affect the performance of an engine.</p>
20	Learning Outcomes:	
	1	Students learn how an ICE runs and provides mechanical energy.

	2	They know the parameters effecting power and other performance outputs and to carry out all calculations in this respect.
	3	They know the basic differences between the two most common ICEs, gasoline and diesel engines and which one is to choose in which application.
	4	They have enough information about all supplementary systems, such as fuel injection, ignition, cooling, lubrication exc., of an ICE necessary to run the engine most efficiently.
	5	They becomes capable of following the the relaten technologies.
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21	Course Content:	
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Course Content:		
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Week	Theoretical	Practice
1	Classification of ICEs, their operation, basic functional and constructional differences Basic elements of an IC engine, supplementary systems and their function in engine operation in brief. Some geometric and performance factor definitions.	
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3	Classification of ICEs, their operation, basic functional and constructional differences Basic elements of an IC engine, supplementary systems and their function in engine operation in brief. Some geometric and performance factor definitions.	
4	Ideal and real engine cycles, cycle calculations.	
5	Flame velocity concept and burning time losses in spark ignition (SI) engines.	
6	Flame velocity concept and burning time losses in spark ignition (SI) engines (continuing) Volumetric efficiency, its effect on engine performance Energy losses and efficiency calculations.	
7	Detonation in SI engines and factors effecting detonation Pre-ignition, reasons of pre-ignition, preventing pre-ignition and detonation Combustion chambers for SI engines.	
8	Detonation in SI engines and factors effecting detonation Pre-ignition, reasons of pre-ignition, preventing pre-ignition and detonation Combustion chambers for SI engines.	

9	Combustion fundamentals, combustion in engines and combustion efficiency Combustion in CI engines diesel knock and factors effecting diesel knock.	
10	Combustion fundamentals, combustion in engines and combustion efficiency Combustion in CI engines diesel knock and factors effecting diesel knock.	
11	Combustion chambers for CI engines Comparing SI and CI engines Two-stroke engines, performance analysis and comparison of them with four stroke engines.	
12	Supercharging, supercharging principles, advantages and disadvantages of each.	
13	Fuel supply systems for SI and CI engines Ignition systems Cooling systems Lubrication systems Starting and electrical charging System	
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22	Textbooks, References and/or Other Materials:	<p>Borat, O., Balcı, M., Sürmen, A.; "İçten Yanmalı Motorlar", G.Ü. Teknik Eğitim Vakfı Yayınları-2, Ankara 1995. ISBN:975-95300-0-7</p> <p>Öz, İ.H, Borat, O., Sürmen, A.; "Internal Combustion Engines", Birsen Bookstore Publications, İstanbul 2003.</p> <p>Öz, İ.H.; "Motorlar", Cilt I ve Cilt II, Birsen Kitabevi Yayınları, İstanbul 1962.</p> <p>Rogowski, A.R.; "Elements of Internal Combustion Engines", Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 1986.</p> <p>Stone, R.; "Introduction to Internal Combustion Engines", MacMillan Publishing Ltd., Hong Kong 1985. ISBN: 0-333-37593-9</p> <p>Janota, M.S. (Editor); "Vehicle Engines", Petr Peregrinus Ltd., England 1974. ISBN: 0-901223-61-1.</p> <p>Obert, E. F.; "Internal Combustion Engines and Air Pollution", Harper and Row Publishers, New York 1973. ISBN: 0-352-04560-0.</p> <p>Taylor, C. F.; "Internal Combustion Engines in Theory and Practice, Volume I and Volume II", Second Edition, The M.I.T. Press, U. S. A. 1985. ISBN: 0-262-20051-1.</p> <p>Pulkrabek, W. W.; "Engineering Fundamentals of the Internal Combustion Engines", Prentice Hall, New Jarsey 1997. ISBN: 0-13-570854-0.</p> <p>Heisler, H.; "Advanced Engine Technology", SAE publications, Great Britain, 1995. ISBN: 1-56091-734-2.</p>
23	Assesment	

TERM LEARNING ACTIVITIES	NUMBER	WEIGHT
Midterm Exam	0	0.00
Quiz	0	0.00
Home work-project	2	40.00
Final Exam	1	60.00
Total	3	100.00
Contribution of Term (Year) Learning Activities to Success Grade		40.00
Contribution of Final Exam to Success Grade		60.00
Total		100.00
Measurement and Evaluation Techniques Used in the Course	Midterm exam is given as the average of 4 or 5 homework grades, including at least one or two questions that require in-depth analysis on each topic. The final exam is given in the form of "homework" similar to the yearly assignments but more comprehensive. Course evaluation is done over a midterm and a final exam.	

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	2	30.00	60.00
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	18.00	18.00
Total Work Load			180.00
Total work load/ 30 hr			6.00
ECTS Credit of the Course			6.00

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CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS

	PQ1	PQ2	PQ3	PQ4	PQ5	PQ6	PQ7	PQ8	PQ9	PQ10	PQ11	PQ12	PQ13	PQ14	PQ15	PQ16
ÖK1	2	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0
ÖK2	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK3	2	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0
ÖK4	1	3	0	0	3	0	0	0	0	0	0	0	0	0	0	0
ÖK5	0	2	0	2	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
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