

Course description

Course abbreviation:	KKS/SM	Page:	1 / 3
Course name:	Combustion Engines		
Academic Year:	2023/2024	Printed:	03.06.2024 07:14

Department/Unit /	KKS / SM			Academic Year	2023/2024
Title	Combustion Engines			Type of completion	Exam
Accredited/Credits	Yes, 4 Cred.			Type of completion	Combined
Number of hours	Lecture 3 [Hours/Week] Tutorial 1 [Hours/Week]			Course credit prior to	YES
Occ/max	Status A	Status B	Status C	Counted into average	YES
Summer semester	0 / -	0 / -	0 / -	Min. (B+C) students	10
Winter semester	16 / -	0 / -	0 / -	Repeated registration	NO
Timetable	Yes			Semester taught	Winter, Summer
Language of instruction				Internship duration	0
Optional course	Yes			Ev. sc. – cred.	S N
Evaluation scale	1 2 3 4				
No. of hours of on-premise					
Auto acc. of credit	Yes in the case of a previous evaluation 4 nebo nic.				
Periodicity	K				
Substituted course	None				
Preclusive courses	N/A				
Prerequisite courses	N/A				
Informally recommended courses	N/A				
Courses depending on this Course	N/A				

Course objectives:

The aim of the course is to equip students information about combustion engines.

- To introduce students to the fundamentals of design thinking and methods and tactics used in the engineering design of spark ignition (SI) engines and compression ignition (CI) engines(two-cycle and four-cycle engines).
- To introduce students area of the designing of the small engine part groups through the examples show the possible consequences of poor design and teach students to prevent the fatal consequences of these errors.
- To introduce students to the information related to the engine properties - fuels, chemical processes, legislature

Requirements on student

criteria for exam:

- fulfil a credit test
- written and oral exam

Content

Content of lectures and seminars after each week

Lecture topics overview

1. Basic concepts and classification of internal combustion engines.
2. Petrol and diesel engines, two-stroke and four-stroke engines.
3. Areas of application, individual specifics.
4. Main parts of internal combustion engine and their function.
5. Fuels and lubricants.
6. Calculation of main dimensions, efficiency of internal combustion engine.
7. Crank system.
8. Combustion space, distribution systems.
9. Engine lubrication and cooling.
10. Combustion systems for different types of engines, ignition and injection systems, exhaust system.
11. Assessment of emissions of individual types of engines and used fuels in terms of environmental impact, catalysts.

12. Possibilities of increasing performance characteristics.
13. Engine starting systems and accessories.
14. Internal combustion engines with rotating pistons.

Exercise plan

1. Introduction to the content of the exercises, conditions for obtaining credit, safety regulations during exercises
- 2.-5. Workshop exercise on the Škoda-Auto 1,6l MPi 1AV engine
- 6.-9. Workshop exercise on the Škoda-Auto 1.9L TDI PD engine
- 10.-11. Workshop exercise on the Škoda-Auto V6 2.5l TDI engine
12. Credit test.
13. Credit.

Fields of study

viz COURSEWARE

Guarantors and lecturers

- **Guarantors:** Doc. Ing. Martin Hynek, Ph.D. (100%)
- **Lecturer:** Prof. Ing. Jan Kovanda, CSc. (50%), Doc. Ing. Ladislav Němec, CSc. (50%)
- **Tutorial lecturer:** Ing. Dominik Fink (100%)

Literature

- **Basic:** Kožoušek, Josef. *Výpočet a konstrukce spalovacích motorů I*. Vyd. 1. Praha : Státní nakladatelství technické literatury, 1978.
- **Extending:** Merker, Günter P.; Schwarz, Christian; Teichmann, Rüdiger. *Combustion engines development : mixture formation, combustion, emissions and simulation / [AVL]. Günter P. Merker., ed.*. Heidelberg : Springer, 2011. ISBN 978-3-642-02951-6.
- **Recommended:** Košťál J.; Suk B. *Pístové spalovací motory*. Nakladatelství ČSAV Praha, 1963.
- **Recommended:** Hromádka, Jan. *Spalovací motory : komplexní přehled problematiky pro všechny typy technických automobilních škol*. 1. vyd. Praha : Grada, 2011. ISBN 978-80-247-3475-0.

Time requirements

All forms of study

Activities	Time requirements for activity [h]
Practical training (number of hours)	52
Preparation for an examination (30-60)	30
Preparation for comprehensive test (10-40)	40
Total:	122

assessment methods

Knowledge - knowledge achieved by taking this course are verified by the following means:

Combined exam

Skills - skills achieved by taking this course are verified by the following means:

Combined exam

prerequisite

Knowledge - students are expected to possess the following knowledge before the course commences to finish it successfully:

Supposed knowledge is in the range of present university education.

be able to independently use the knowledge of mechanics, elasticity and strength

know the basic theoretical principles of laws of thermodynamic system

orientate in basic problems of machining technology

to orientate themselves well in the problems of theoretical construction subjects - parts of machines and foundations of construction, construction materials, technology, casting, forming

Skills - students are expected to possess the following skills before the course commences to finish it successfully:

solve simple problems of kinematics, mass point dynamics and system

use their professional skills in at least one foreign language

work with mathematical functions of basic algebra

teaching methods

Knowledge - the following training methods are used to achieve the required knowledge:

Lecture supplemented with a discussion

Laboratory work

Skills - the following training methods are used to achieve the required skills:

Laboratory work

learning outcomes

Knowledge - knowledge resulting from the course:

Students will obtain constructional knowledge in the field of combustion engine.

have an overview of the development and current state of construction of piston engines and their components

have knowledge of the design of individual engine nodes

have knowledge of the individual phases of operation of 4- and 2-stroke engines

to have an overview of the principles of work of internal combustion engines, classification according to mixture formation

Skills - skills resulting from the course:

be able to assess the design of existing reciprocating internal combustion engines for suitability for the intended use

be able to independently identify and formulate problems related to the design of internal combustion engines

be able to propose a suitable constructional solution of individual engine nodes with regard to the technology and expected method of assembly

Competences - competences resulting from the course:

N/A

N/A

Course is included in study programmes:

Study Programme	Type of	Form of	Branch	Stage	St. plan	v.	Year	Block	Status	R.year	R.
Design Engineering of Machines and Technical Devices	Postgraduate Master	Combined	Design Engineering of Vehicles and Handling Machinery	1	2020	2023		Compulsory courses	A	1	ZS
Design Engineering of Machines and Technical Devices	Postgraduate Master	Full-time	Design Engineering of Vehicles and Handling Machinery	1	2020	2023		Compulsory courses	A	1	ZS