STUDY MODULE DESCRIPTION FORM

Name of the module/subject **(-)**		Code **1010621261010627122**
Field of study **Mechanical Engineering**	Profile of study (general academic, practical) **(brak)**	Year /Semester **3 / 6**
Elective path/specialty **Internal Combustion Engines**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **1** Classes: **1** Laboratory: **1** Project/seminars: **-**		No. of credits **4**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art **technical sciences**		ECTS distribution (number and %) **4 100%**

Responsible for subject / lecturer:

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Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	student has a basic knowledge of design and working principles of mechanics, physics, chemistry, materials strength, appropriate to the field of studies
2	**Skills**	student is able to interpret basics of processes and phenomenon occurring in piston engines, grate the information, make their interpretation, draw conclusions, formulate and justify opinions mainly on cause and effect relationships in mechanics, physics, chemistry.
3	**Social competencies**	Student is able to cooperate in a group, taking different roles, student is aware of the important means non-technical aspects and impacts of operation of combustion engines; students is able to define priorities in solving predefined technical tasks.

Assumptions and objectives of the course:

To teach the student definitions and main principles of internal engines design and rules of functioning of engine structural parts, and engines as a whole; explanation of physical and thermodynamic principles of internal combustion engine operating; explanation of principles of main elementary processes in engines. Rules of processing of primary (chemical) energy into mechanical work. Description and explanation of functioning and design of main structural parts and elements of IC engines.

Discussion of principles of IC engines controlling and influencing on it basic operating indexes.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Student has a broader and deeper knowledge of design and operating of modern IC engines [- [W13]
2. Student has knowledge of constructional elements of IC engines and can recognise reasons of its miss functioning - [W16]
3. Student has a detailed knowledge about systems applied in combustion engines and knowledge about trends in its development and testing - [W20]

Skills:

1. The student is able to explain basics of mechanical and thermodynamical processes related to IC - [U09]
2. He knows how to use analytical and experimental methods to formulate and solve problems associated with the IC Engines - [U21]
3. Students can obtain information from the literature to make their identification and draw conclusions specific to design and operating of combustion engines - [U01]
4. Student is able to plan and carry out experiments on the IC engines - [U07]
5. Student is able to analyze and evaluate the functioning of the existing technology by identification of cause and effect relationships in internal combustion engines - [U10]

Social competencies:

1. The student understands the necessity of lifelong learning - raising professional and personal - [K01]
2. The student is able to think and act in a creative and enterprising - [K07]
3. The student is aware of their responsibility for collaborative tasks related to teamwork - [K04]

Assessment methods of study outcomes

Discussion with the use of visual materials related to internal combustion engines.

The written examination, perform exercises based on the work carried out and perform laboratory testing of engines and its constructional elements.

Course description

Definition IC engines and their structural elements. Systematization of IC engines and their application. Thermodynamical cycles, their systematisation and mathematical analysis. Theoretical vs. real cycles. Operating parameters of engines in real and theoretical cycles. Fundamentals of heat transfer analysis in IC engines. Engine operating indexes. Rules and processes of mixture formation and engine load control. Systematisation of engine combustion systems. Engine combustion process course. Basic information concerning two-stroke engines. Tendencies of development of IC engines.

Basic bibliography:

1. Rychter T., Teodorczyk A.: Teoria silników spalinowych. WKiŁ, Warszawa 2005.
2. Jeż M.: Silniki spalinowe. Zasady działania i zastosowania. Bibl. Nauk. Instytutu Lotnictwa, W-wa 2008.
3. Luft S.: Podstawy budowy silników. WKiŁ, Warszawa, 2000.
4. Serdecki W. (red.): Badania silników spalinowych. Wyd.PP, 1998, 2001.
5. Serdecki W. (red.): Badania układów silników spalinowych. Wyd.PP, 2000.

Additional bibliography:

1. Kowalewicz A.: Podstawy procesów spalania. WNT. Warszawa 2000.
2. Niewiarowski K.: Tłokowe silniki spalinowe. WKiŁ, Warszawa 1983.
3. Kowalewicz A.: Systemy spalania szybkoobrotowych tłokowych silników spalinowych. WKiŁ. W-wa, 1980.
4. Additional bibliography: Kowalewicz A.: Podstawy procesów spalania. WNT. Warszawa 2000. Niewiarowski K.: Tłokowe silniki spalinowe. WKiŁ, Warszawa 1983. Kowalewicz A.: Systemy spalania szybkoobrotowych tłokowych silników spalinowych. WKiŁ. W-wa, 1980. Kowalewicz A.: Tworzenie mieszanki i spalanie w silnikach o zapłonie iskrowym. WKiŁ. Warszawa, 1984 Result of average student's workload

Result of average student's workload

Activity	Time (working hours)
1. Participation in the lecture	30
2. Consulting (lecture)	10
3. Exam preparation	20
4. Participation in the exam	2
5. Prepare for training auditorium	30
6. Participation in exercises auditorium	30
7. Consulting (excersice)	10
8. Preparing to pass	10
9. Participation in passing the material	2

Student's workload

Source of workload	hours	ECTS
Total workload	80	4
Contact hours	65	3
Practical activities	15	1