STUDY MODULE DESCRIPTION FORM

Name of the module/subject	Code
Gas Engines: Turbines and reciprocating engines	**1010632221010636540**

Field of study	Profile of study (general academic, practical)	Year /Semester
Mechanika i budowa maszyn	**(brak)**	**1 / 2**
Elective path/specialty	**Subject offered in:**	**Course (compulsory, elective)**
Gas technology and renewable energy	**English**	**obligatory**

Cycle of study:	Form of study (full-time,part-time)
Second-cycle studies	**full-time**

No. of hours	No. of credits
Lecture: **2** Classes: **1** Laboratory: **1** Project/seminars: **-**	**4**

Status of the course in the study program (Basic, major, other)	(university-wide, from another field)
(brak)	**(brak)**

Education areas and fields of science and art	ECTS distribution (number and %)
technical sciences	**3 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Basic knowledge from thermodynamics, fluid mechanics, mechanics, and construction of gas engines.
2	**Skills**	Can use the scientific method for problem solving, experimenting, and making conclusions
3	**Social competencies**	Knows the limitations of his or her own knowledge and skills, understands the non-technical aspects and results of engineering activity and their importance

Assumptions and objectives of the course:

To acquaint students with the theoretical and practical problems related to the flow issues, materials issues and exploatation parameters of internal combustion gas engines and gas turbine and CHP systems

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

Knowledge:

1. 1. Has an in-depth knowledge of the design and principles of operation and grading of gas engines. ? [K2A_W18] - [-]
2. Knows the effect basic operating parameters have on the performance of gas piston internal combustion engines and gas turbine ? [K2A_W08] - [-]
3. He has in-depth knowledge about the current developments in gas engines and gas turbine ? [K2A_W14] - [-]
4. Has a general understanding of the types of tests and test methods for working machines using modern measurement techniques and data acquisition ? [K2A_W20] - [-]

Skills:

1. Is able to assess potential negative impacts for the natural environment and humans, originating from the gas engines. - [K1A_U14] - [-]
2. . Is able to freely use an international language in contacts with professionals from the same field of study.- [K2A_U01] - [-]
3. .3 Is able to develop technical description, market offer and design documentation for a complex machine from the selected equipment group.- [K2A_U016] - [-]

Social competencies:

1. . Understands the need for lifelong learning; is able to inspire and organize the learning process of others. ? [K2A_K01] - [-]
2. Is aware of and understands the importance and impact of non-technical aspects of mechanical engineering activities and its impact on the environment and responsibility for own decisions. - [K2A_K02] - [-]

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Assessment methods of study outcomes

Lecture ? the written examination

The evaluation of student knowledge will be held based on an answers on 5 questions from the material presented during the lectures.

Classes - - final test and rewarding knowledge necessary for the accomplishment of the problems in the area of the subject,

Course description

Construction of gas engines, internal combustion engines processes, exploitation of internal combustion gas engines, development trends in gas engines construction, work?s cycles, turbocharging, methods of ignition mixtures , diagnostic methods of engines, emission of toxic compounds, engine failures, combustion an unusual gases in engines, Construction and operation of gas turbines, Cooling systems, combustion chamber, methods of flame stabilization, The operating parameters of gas turbines, TIT temperature, cooling gas turbine elements, Gas power plant, CCGT units, simple cycle efficiency, manganese, Trends of development of gas turbines: industrial units and small units

Basic bibliography:

1. 1. Heywood J.B., Internal Combustion Engine Fundamentals,
2. 2. C.R. Ferguson and A.T. Kirkpatrick, Internal Combustion Engines Applied Thermosciences, Second
3. 3. Stone R., Introduction to Internal Combustion Engines,
4. 4. Arthur H. Lefebvre, Dilip R. Ballal, Gas turbine. Combustion. Alternative Fuels and Emissions
5. 5. Meherwan P. Boyce: Gas Turbine Engineering Handbook
6. 6. Chmielniak T. Maszyny Przepływowe. Wydawnictwo Politechniki Śląskiej
7. 7. Wajand J. A., Wajand J. T., Tłokowe Silniki Spalinowe Średnio- i Szybkoobrotowe,
8. 8. Serdecki W., Badania Silników Spalinowych. Laboratorium, Wydawnictwo Politechniki Poznańskiej,
9. 9. Kowalewicz A. Podstawy procesów spalania. WNT, Warszawa 2000

Additional bibliography:

1. Dobski, T.: Combustion Gases in Modern Technologies, 2scd Ed., Wydawnictwo Politechniki Poznańskiej
2. Skorek J. Kalina J.: Gazowe układy kogeneracyjne
3. Miller A.: Turbiny gazowe i układy parowo-gazowe
4. K. Niewiarowski: Tłokowe silniki spalinowe, WKiŁ, 1983
5. Kowalewicz A. Tworzenie mieszanki i spalanie w silnikach o zapłonie iskrowym. WKiŁ
6. R.S. Benson, N.D. Whitehouse: Internal Combustion Engines. Pergamon Press, 1979

Result of average student's workload

Activity	Time (working hours)
1. Preparation for the lecture	5
2. Participation in the lecture	15
3. Fixing the lecture	15
4. Consultation for the lecture	2
5. Preparing to pass the lectur	10
6. Participation in the completion of the lectur	2
7. Preparation of practical classes	7
8. Participation in the classe	15
9. Consultation for the classes	3
10. Preparing to pass the classes	5
11. Participation in the completion of the classe	2
12. Preparation for the laboratory classes	10
13. Participation in the laboratory	15
14. Consultation for the laboratory classes	5
15. Preparing to pass laboratory	3

Student's workload

Source of workload	hours	ECTS
Total workload	114	3
Contact hours	59	0
Practical activities	15	0

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