STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Fluid-Flow Machines		**1010624151010630265**

Field of study	Profile of study (general academic, practical)	Year /Semester
Mechanical Engineering	**(brak)**	**3 / 5**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
Internal Combustion Engines	**Polish**	**obligatory**

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

No. of hours				No. of credits
Lecture: **14**	Classes: **6**	Laboratory: **-**	Project/seminars: **-**	**2**

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	**2 100%**
Technical sciences	**2 100%**

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**	The student has a basic knowledge about the location of compressors and pumps in the system of science and the relationship with other areas of knowledge. The student knows and understands the complex methods and practical tools in the field of compression machines and pumps. The student knows the main tasks of compression machines and pumps in the area of the operation and growth of enterprises and the state.
2	**Skills**	The student is able to use the concepts and methods of design and operational compression machines and pumps. Student is able to use the acquired knowledge to analyze specific physical phenomena and thermodynamic processes occurring in the flow and compression machines and pumps. The student is able to solve specific problems in the design and operational issues compression machines and pumps.
3	**Social competencies**	The student is able to work in a group, taking in her various roles. Student is able to prioritize important in solving the tasks posed in front of him. The student demonstrates self-reliance in solving problems, acquire and improve their knowledge and skills.

Assumptions and objectives of the course:

The aim of the course is to provide students with knowledge of compression machines and pumps: definitions, concepts and issues thermodynamic flow in relation to the process of compression and pumping of liquids. Students gain knowledge and skills in the construction, design methods and uses compression machines and pumps.

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

Knowledge:

1. The student has a basic knowledge of fluid mechanics to the extent necessary for an understanding of the principles and calculation of flow processes occurring in compression machines and pumps.- - [K1A_W06]

2. The student has a basic knowledge of thermodynamic transformations to the extent necessary for an understanding of the principles and calculations of thermodynamic processes occurring in compression machines and pumps - [K1A_W07]

3. The student has a basic knowledge about the types of tests and test methods compression machines and pumps using the basic techniques of measurement and data acquisition - [K1A_W13]

Skills:

1. The student can obtain information from the literature, the Internet, databases and other sources, in Polish and foreign, can integrate the information obtained to interpret and draw conclusions from them, and create and justify opinions.. - [K1A_U01]

2. Student is able to use learned mathematical theories to design a simple one-dimensional in terms of construction of compression and pumps.- - [K1A_U07]

3. Student is able to perform basic technical calculations in the field of fluid mechanics and thermodynamics, in order to balance the energy in terms of compression units and pumping equipment.- - [K1A_U19]

Social competencies:
1. The student understands the need and knows the possibilities of continuous training, knows the need to acquire new knowledge for professional development. - [K1A_K01]
2. Student is able to determine the priorities for implementing the tasks undertaken. - [K1A_K02]
3. Student is able to think and act in an entrepreneurial manner, make decisions, work for the development of the employer and society - [K1A_K05]

Assessment methods of study outcomes
The written examination

Course description
Analysis of basic flow phenomena and thermodynamic changes occurring in compression machines and pumps. Methods for designing one-dimensional compression machines and pumps , the interpretation of physical indicators and indicators of work flow . Knowledge and physical interpretation of the definition of isentropic efficiency , polytropic , volumetric , mechanical, electrical , general compression machines and methods of lifting . The methods of selection and flow parameters of the compression machinery and the pumps working in series and in parallel . Ways to protect equipment from damage tendons as a result of exceeding the operating parameters and the occurrence of phenomena pumping. The choice of compression equipment for compressed air systems and selection of pumps for hydraulic systems . Methods for determining losses and leakage flow wading in compression machines and systems, reciprocating and screw positive displacement flow machines .

Basic bibliography:

1. Tuliszka E., Sprężarki, dmuchawy i wentylatory, WNT, Warszawa 1976.
2. Sakun I. A., Sprężarki śrubowe, WNT, Warszawa 1960
3. Prandtl L., Dynamika gazów, PWN, Warszawa 1956.
4. Jędral W., Pompy wirowe, Wydawnictwo Naukowe PWN, Warszawa 2001

Additional bibliography:

1. Fodemski T.R. i inni, Pomiary cieplne cz.II, Badania cieplne maszyn i urządzeń, WNT, Warszawa 2000
2. Walczak J., Termodynamiczno-przepływowe podstawy mechaniki płynów, Wydawnictwo Politechniki Poznańskiej, Poznań 2005
3. Walczak J., Inżynierska mechanika płynów, Wydawnictwo Politechniki Poznańskiej, Poznań 2006.

Result of average student's workload

Activity	Time (working hours)
1. Participation in the lecture	30
2. Consultation	8
3. Exam preparation	10
4. Preparing to pass	10
5. Participation in the exam	2

Student's workload

Source of workload	hours	ECTS
Total workload	60	2
Contact hours	40	2
Practical activities	0	0