STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Mechanical Structures		**1010101241010130901**
Field of study	Profile of study (general academic, practical)	Year /Semester
Environmental Engineering First-cycle Studies	**(brak)**	**2 / 4**
Elective path/specialty	Subject offered in:	Course (compulsory, elective)
-	**Polish**	**obligatory**

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

No. of hours				No. of credits
Lecture: **30**	Classes: **15**	Laboratory: **-**	Project/seminars: **15**	**6**

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 %)

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**	Knowledge of selected topics in mathematics, physics, engineering mechanics, materials strength and thermodynamics
2	**Skills**	Use the knowledge to explain processes and phenomena in mechanical and flow devices
3	**Social competencies**	Awareness of the need to constantly update and supplement knowledge and skills Able to share their skills with people in the group

Assumptions and objectives of the course:

1. Purchase by the students skills of resolving basic problems of mechanical strength in mechanical constructions
2. Getting to know with flow devices used in heating, ventilation and air conditioning.

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

Knowledge:

1. Basic rules of calculation and selection of the most commonly used machine connections. - [-] - [-]
2. Types, principles and functions of valves used for cold and hot water. - [-] - [-]
3. Types, principles of operation, methods of selection and adjustment of pumps used for cold and hot water. - [-]
4. Types, principles and ways to adjust the fan in the ventilation and air conditioning - [-]

Skills:

1. Execution of construction drawings of single parts and assembly drawing of simple devices, - [-]
2. Execution of drawings of buildings in sections and rectangular projections in accordance with the applicable rules and graphical notations - [-]
3. . Execution of installation drawings on rectangular projection construction layouts as well as in axonometric - [-]

Social competencies:

1. The student understands the importance of engineering and its impact on the environment - [-]
2. The student is able to think and act in an enterprising way - [-]
3. The student is able to prioritize appropriately in carrying out tasks - [-]

Assessment methods of study outcomes

Lectures: Written final test

Project: Execution and completion of design projects: 2 (typical mechanical constructions) + 1 (pumping station).

Course description

Mechanical loads and stresses. Fatigue strength. Uncoupled connections - welded and rivet connections, and coupled connections ? screw connections. The function of fittings. Shutoff valves, dampers and non-return valves. Control valves and safety valves ? construction, principles of functioning, application. Thermostatic valves - construction, principles of functioning, criterion of throttling. Types of pumps ? operation parameters: capacity, pumping pressure, power, efficiency. Pumping system ? geometrical and energy quantities. Cavitations in pumping systems. Characteristics of rotary pumps and their operating point. Parallel and series operation of pumps. Control of pumps capacity. Fans and blowers ? characteristics of devices, specific measures. Types of fans. Characteristics of centrifugal fans. Axial fans ? construction, velocity and pressure pattern, supply power. Control of axial fans.

Basic bibliography:

1. Janiak M.: Urządzenia mechaniczne w inżynierii środowiska. Cz.1. Wydawnictwo Politechniki Poznańskiej 1993.

2. Janiak M., Krzyżaniak G.: Urządzenia mechaniczne w inżynierii środowiska. Cz. 2. Wydawnictwo Politechniki Poznańskiej 1995.

3. Praca zbiorowa: Mały Poradnik Mechanika tom I i II. Warszawa 1998

Additional bibliography:

1. Stępniewski : Pompy. PWN Warszawa

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	30
2. Participation in project exercises	30
3. Participation in project exercises	30
4. Preparation (at home) for the project exercises	10
5. Participation in consultations related to the project exercises	5
6. Preparation for the final test	14
7. Final test	1

Student’s workload

Source of workload	hours	ECTS
Total workload	120	6
Contact hours	60	0
Practical activities	60	0