

<b>STUDY MODULE DESCRIPTION FORM</b>		
Name of the module/subject <b>Basics of Freezing and Food Storage</b>		Code <b>1010611261010615313</b>
Field of study <b>Transport</b>	Profile of study (general academic, practical) <b>(brak)</b>	Year /Semester <b>3 / 6</b>
Elective path/specialty <b>Food Transport</b>	Subject offered in: <b>Polish</b>	Course (compulsory, elective) <b>obligatory</b>
Cycle of study: <b>First-cycle studies</b>	Form of study (full-time, part-time) <b>full-time</b>	
No. of hours Lecture: <b>1</b> Classes: <b>-</b> Laboratory: <b>1</b> Project/seminars: <b>-</b>		No. of credits <b>3</b>
Status of the course in the study program (Basic, major, other) <b>(brak)</b>		(university-wide, from another field) <b>(brak)</b>
Education areas and fields of science and art		ECTS distribution (number and %)
<b>Responsible for subject / lecturer:</b>  dr hab. inż. Krzysztof Bieńczak email: krzysztof.bieniczak@put.poznan.pl tel. 665-2655, 647-5888 MRiT ul. Piotrowo 3, 60-695 Poznań		
<b>Prerequisites in terms of knowledge, skills and social competencies:</b>		
1	<b>Knowledge</b>	Student has a basic knowledge of thermodynamics and fluid mechanics.
2	<b>Skills</b>	Student can take measurements in the field of basic fluid mechanics and thermodynamics.
3	<b>Social competencies</b>	He is aware of conduct in a professional manner.
<b>Assumptions and objectives of the course:</b> Understanding the theoretical and practical problems associated with the construction and operation of cold storage facilities.		
<b>Study outcomes and reference to the educational results for a field of study</b>		
<b>Knowledge:</b> 1. It has a structured, theoretically founded knowledge of the construction and operation of refrigeration facilities. He knows the dangers and safety devices compressor. - [K1A_W24]		
<b>Skills:</b> 1. It can make a balance of the cooling chamber and then design for the cooling system. - [K1A_U04 K1A_U16] 2. It can measure the basic parameters of the cooling system in order to diagnose the condition. He can reasonably operate refrigeration facilities. - [K1A_U04 K1A_U16]		
<b>Social competencies:</b> 1. He understands the importance of refrigeration and refrigerated transport as a way to reduce food waste and environmental hazards. - [K1A_K02]		
<b>Assessment methods of study outcomes</b>		
Written examination and routine inspection laboratory preparation and evaluation of their progress.		
<b>Course description</b>		

Distribution and operation of refrigeration equipment. Linde circuits (wet and dry). Of sub-cooling circuit. Regeneration circuit. Parameters characterizing single refrigeration. Multi-stage circuits. The loss of refrigeration compressor, refrigerants. Coolants. Lubricating oils. Division of compressors. Construction of piston compressors, screw and scroll. Capacity control. Lubrication. Types of hazards and safety devices compressor. Factors affecting the efficiency of the compressor. Condensers (classification, construction, operation). Vaporizers (classification, construction, operation). Regulators (classification, principles of operation, construction, operation).

**Basic bibliography:**

1. Poradnik niezawodności. T 1. pod red. J. Migdalskiego, Wyd. WEMA, Warszawa 1982r.
2. Poradnik niezawodności. T 2. pod red. J. Migdalskiego, Wyd. WEMA, Warszawa 1996r.
3. Szopa T. Niezawodność i bezpieczeństwo. W: ?Podstawy konstrukcji maszyn? pod red. M. Dityrycha. tom 1. PWN Warszawa 1999r.
4. Nadolny K., Tribologia kół zębatych. Zagadnienia trwałości i niezawodności. Biblioteka Problemów Eksploatacji. Wyd. Instytut Technologii Eksploatacji, Radom, 1999r
5. Podstawy modelowania niezawodności materiałów eksploatacyjnych.pod red.K.Nadolnego, Biblioteka Problemów Eksploatacji. Wyd. Instytut Technologii Eksploatacji, Radom, 1999r
6. Szopa T., Niezawodność i bezpieczeństwo. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa, 2009.

**Additional bibliography:**

1. Warszyński M., Niezawodność w obliczeniach konstrukcyjnych. PWN. Warszawa 1988r.
2. Radkowski S., Podstawy bezpiecznej techniki. Oficyna Wydawnicza Pol. Warszawskiej, Warszawa 2003.
3. Bobrowski D., Modele i metody matematyczne teorii niezawodności w przykładach i zadaniach, WNT, Warszawa, 1985r.

**Result of average student's workload**

Activity	Time (working hours)	
1. Participation in the lecture	15	
2. Preparation for laboratory	12	
3. Participation in laboratory exercises	15	
4. Capturing the content of training, the report	12	
5. Participation in the completion	1	
6. Consultation	3	
7. Preparation for the exam	10	
8. Participation in the exam	2	
<b>Student's workload</b>		
Source of workload	hours	ECTS
Total workload	70	3
Contact hours	36	1
Practical activities	42	2