



## Subject card

Subject name and code	Thermodynamics, PG_00039797						
Field of study	Materials Engineering, Materials Engineering, Materials Engineering						
Date of commencement of studies	October 2022		Academic year of realisation of subject		2023/2024		
Education level	first-cycle studies		Subject group		Obligatory subject group in the field of study		
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		5.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Physical Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Dorota Warmińska				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	0.0	0.0	60
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	60		5.0		60.0	125
Subject objectives	The aim of the subject is familiarizing the students with fundamentals of thermodynamic analysis of physico-chemical systema, esp. those including chemical equilibria and phase equilibria.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	K6_U06		The student can describe and analyze physicochemical systems from thermodynamic point of view, especially chemical and phase equilibria.		[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information		
	K6_K01		The students understand the need expanding their knowledge and are aware of their own limitations.		[SK3] Assessment of ability to organize work [SK5] Assessment of ability to solve problems that arise in practice		
	K6_W02		The student is able to use knowledge in mathematics, physics and chemistry for thermodynamic description.		[SW1] Assessment of factual knowledge		
Subject contents	Laws of thermodynamics. Thermochemistry and calorimetry. State functions. Equations of state. Chemical equilibria. Phase equilibria in single and multicomponent systems. Phase diagrams.						
Prerequisites and co-requisites	Knowledge of mathematics, physics and chemistry at BSc level.						
Assessment methods and criteria	Subject passing criteria		Passing threshold		Percentage of the final grade		
	written exam		50.0%		50.0%		
	performing 5 experiments and delivering the reports		100.0%		50.0%		

Recommended reading	Basic literature	<p>1. Chemia fizyczna. P.W.Atkins, PWN</p> <p>2. Chemia fizyczna. 1.Podstawy fenomenologiczne. K.Pigoń i Z.Ruziewicz, PWN</p> <p>3. Chemia fizyczna. Ćwiczenia laboratoryjne. Red.: H.Strzelecki i W.Grzybowski, Wydawnictwo PG</p>
	Supplementary literature	<p>1. Wykłady z chemii fizycznej (praca zbiorowa). Wydawnictwo NT</p> <p>2. Chemia fizyczna. 2.Fizykochemia molekularna. K.Pigoń i Z.Ruziewicz, PWN</p> <p>3.Eksperymentalna chemia fizyczna.Red.: H.Strzelecki, Wydawnictwo PG</p> <p>4. Podstawy termodynamiki. H. Buchowski, W. Ufnalski, Wydawnictwo NT</p> <p>5. Gazy, ciecze, płyny. H. Buchowski, W. Ufnalski, Wydawnictwo NT</p>
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	<p>Define and discuss the concept of thermodynamic equilibrium.</p> <p>Discuss the concepts of specific heat at constant volume and constant pressure. Derive a general relationship between them and give its physical meaning. Apply the results obtained to perfect gas.</p> <p>Discuss the relationships between thermodynamic potentials <math>U(V, S)</math>, <math>H(S, p)</math>, <math>F(V, T)</math>, <math>G(p, T)</math>.</p> <p>Formulate, derive and discuss the Gibbs phase rule.</p>	
Work placement	Not applicable	