1.	**Nazwa kierunku**	**biofizyka**
2.	Wydział	Wydział Nauk Ścisłych i Technicznych
3.	Cykl rozpoczęcia	2022/2023 (semestr zimowy), 2023/2024 (semestr zimowy), 2024/2025 (semestr zimowy)
4.	Poziom kształcenia	studia drugiego stopnia
5.	Profil kształcenia	ogólnoakademicki
6.	Forma prowadzenia studiów	stacjonarna

Moduł kształcenia: Materials Science of Drugs

Kod modułu: W4-2BF-MB-21-13

1. Liczba punktów ECTS: 4

2. Zakładane efekty uczenia się modułu

kod	opis	efekty uczenia się kierunku	stopień realizacji (skala 1-5)
MB_13_1	students will be able to discuss the equilibrium conditions for a phase or phase coexistence, draw multiphase and/or binary phase diagrams, and distinguish between different equilibrium, metastable, and unstable states, and their relevance for drug formulations	KBF_K06 KBF_U01 KBF_U02 KBF_U11 KBF_W02	3 4 4 3 4

3. Opis modułu

Opis	The purpose of this unit is to provide an overview of the thermodynamics of phase equilibrium and phase transitions, with application to the polymorphism of drugs, and to introduce binary phase diagrams and the non-equilibrium glass state, with applications in the field of amorphous drugs. Course syllabus: (1) Basic concepts of crystallography: translational order, unit cell, Bravais lattices. Point groups, space groups, crystal systems. Crystallographic planes, reciprocal lattice, Miller indices. From crystal system to molecular structure and geometry: crystals with a base and molecular crystals. Calculation and modeling of diffraction patterns from atomic and structure scattering factors. Solid-state polymorphism of drugs and other organic molecules. (2) Phase Equilibrium and phase transitions (Thermodynamic Potentials for hydrostatic pvT systems; Maxwell relations; TdS equations; General conditions for equilibrium; Fluctuations; Le Châtelier principle) (3) Phase transitions and topological pressure-temperature phase diagram (Equilibrium conditions for hydrostatic pvT systems; First-order phase transitions: Clausius-Clapeyron equation. Stability and metastability domains; High-order phase transitions. Group-subgroup phase transitions. Second-harmonic generation; Critical and triple points; Topological P-T phase diagram. (4) Landau's theory for phase transitions. Ferroelastic phase transitions. Long-range anisotropic interactions. Self-accommodation. Structural phase transitions. Mechanistic and kinetic classification of phase transitions.

	(5) Phases out of equilibrium (Glass state and glass transition; dynamics and structural relationships in the glass state; pressure dependence of the glass transition temperature; non-equilibrium phases and mesophases of drugs) (6) Binary systems (thermodynamics of mixing, thermodynamic potential; types of binary phase diagrams: eutectic, metatectic, and peritectic; solubility and miscibility; metastable and unstable states; nucleation vs spinoidal decomposition. The course will include laboratory sessions.
Wymagania wstępne	

4. Sposoby weryfikacji efektów uczenia się modułu

kod	nazwa (typ)	opis	efekty uczenia się modułu
MB_13_w_1	zaliczenie	the basis for obtaining credit will be the grades from homework and laboratory reports	MB_13_1

5. Rodzaje prowadzonych zajęć

kod	rodzaj prowadzonych zajęć			praca własna studenta		sposoby weryfikacji efektów uczenia się
	nazwa	opis (z uwzględnieniem metod dydaktycznych)	liczba godzin	opis	liczba godzin	
MB_13_fs_1	wykład	Detailed discussion by the lecturer of the issues listed in the table "module description" using the table and/or multimedia presentations	30	Supplementary reading, working with the textbook, doing homework	45	MB_13_w_1
MB_13_fs_2	laboratorium	Performance of exercises on the subject consistent with the issues listed in the table "module description"	6	Acquiring knowledge in the scope of the exercise, preparation of the final report on a given exercise	19	MB_13_w_1