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| 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 | 3 |
| | | KBF_U01 | 4 |
| | | KBF_U02 | 4 |
| | | KBF_U11 | 3 |
| | | KBF_W02 | 4 |

3. Opis modułu

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| Opis | <p>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:</p> <p>(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.</p> <p>(2) Phase Equilibrium and phase transitions (Thermodynamic Potentials for hydrostatic pV-T systems; Maxwell relations; TdS equations; General conditions for equilibrium; Fluctuations; Le Châtelier principle)</p> <p>(3) Phase transitions and topological pressure-temperature phase diagram (Equilibrium conditions for hydrostatic pV-T 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.</p> <p>(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.</p> |
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| | (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 | | | |
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| 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 |