KAPITAŁ LUDZKI
NARODOWA STRATEGIA SPÓJNOŚCI
Projekt współfinansowany przez Unię Europejską w ramach Europejskiego Funduszu Społecznego
UNIA EUROPEJSKA
EUROPEJSKI FUNDUSZ SPOŁECZNY

Course title	ECTS code
Statistical mechanics of biological macromolecules	13.3.1313

Name of unit administrating study

null

Studies

faculty	field of study		
Faculty of Chemistry	Chemistry	type	second tier studies (MA)
		form	full-time
		specialty	all
		specialization	all

Teaching staff

prof. dr hab. Józef Liwo

Forms of classes, the realization and number of hours

Forms of classes

Auditorium classes

The realization of activities

classroom instruction

Number of hours

Auditorium classes: 30 hours

ECTS credits

2
auditorium classes – 30 h
tutorial classes – 5 h
student's own work – 15 h
Total: 50 h – 2 ECTS

The academic cycle

2023/2024 winter semester

Type of course

an elective course

Language of instruction

english

Teaching methods

During the auditorium classes students will conduct hands on exercises in the computational laboratory, based on the instructions prepared by the teacher.

Form and method of assessment and basic criteria for eveluation or examination requirements

Final evaluation

Graded credit

Assessment methods

A set of written tests.

The basic criteria for evaluation

according to "Rules and regulations for studies at the University of Gdansk"

Method of verifying required learning outcomes

The method of verifying the acquisition of knowledge:
oral presentation and argumentation during the discussion, the student solves problems in writing (tests)
The method of verifying the acquisition of skills: the student solves problems in writing (tests) or oral (oral answer) in the field of statistical mechanics of biological macromolecules.
The method of verifying the acquisition of social competences:
observation of the student's behavior during classes and during consultations

Required courses and introductory requirements

A. Formal requirements
Statistical mechanics in chemistry

B. Prerequisites
None

Aims of education

The aim of the course is to familiarize students with the basics of statistical mechanics of biopolymers, with particular emphasis on the conditions and mechanisms their structure formation

Course contents

Elements of statistical mechanics: ensembles, ensemble averages, thermodynamic connection.
Statistical-mechanical models of polymers chains.
Potentials of mean force.
Structure formation and self-organization in biopolymers as a phase transition.
One-dimensional case: helix-coil transition.
Solvent-mediated interactions in the formation and stabilization of biopolymer structure. Polymers in a good and in a bad solvent.
Global minimum of a potential and of the free energy and stability of polymer structure.
Foldability.
Simple lattice models to study foldability.
Free-energy landscapes of biological macromolecules and methods for their investigation.
Coarse-grained force fields for biopolymer simulations as potentials of mean force

Bibliography of literature

D. McQuarrie, Statistical Mechanics, University Science Books, 2000

The learning outcomes (for the field of study and specialization)

K_W05: has extended knowledge in the field of the specialisation studied

K_W06: applies mathematics to the extent necessary to understand, describe and model chemical processes of extended complexity.

K_U02: critically assesses the results of conducted, performed observations and theoretical calculations and discusses errors

K_U11: communicates in a foreign language in accordance with the requirements specified for level B2 of the Common European Framework of Reference for Languages and can use specialist terminology

K_K01: knows the limitations of her/his own knowledge; understands the need for further education and can inspire other people to do so

K_K06: undertakes research tasks consciously and responsibly, understanding the social aspects of the practical application of the acquired knowledge and skills and the responsibility related to it

Knowledge

The student correctly identifies the ensembles, knows, and understands statistical mechanics laws and their application to structure and dynamics of biological macromolecules.

Skills

The ability to apply the formalism of statistical mechanics to connect the chemical structure of biomolecules with their physicochemical properties.

Social competence

The student develops the skills of accurate and logical thinking and inference.

Contact

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