Univerza v Mariboru
Medicinska fakulteta

UČNI NAČRT PREDMETA / COURSE SYLLABUS			
Ime predmeta:	**Molekularna biofizika**		
Course title:	**Molecular Biophysics**		
Študijski program in stopnja **Study programme and cycle**	**Študijska smer** **Study option**	**Letnik** **Year of study**	**Semester** **Semester**
Biomedicinska tehnologija/3. stopnja		**2**	**3 ali 4**
Biomedical Technology/3rd Degree			

Vrsta predmeta (obvezni ali izbirni) / **Course type (compulsory or elective)**	Izbirni Elective
Univerzitetna koda predmeta / University course code:	

Predavanja **Lectures**	**Seminar** **Seminar**	**Vaje** **Tutorial**			**Klinične vaje** **Clinical training**	**Druge oblike študija** **Other forms of study**	**Samost. delo** **Individual work**	**ECTS**
		10						
15	**20**	**AV**	**LV**	**RV**			**135**	**6**

Nosilec predmeta / Course coordinator:	Prof. dr. Janez Štrancar

Jeziki /Languages:	**Predavanja / Lectures:**	Slovenščina/Slovene
	Vaje / Tutorial:	Slovenščina/Slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites for enrolling in the course or for performing study obligations:**

Vsebina (kratek pregled učnega načrta):	**Content (syllabus outline):**
Struktura beljakovin, nukleinskih kislin in polisaharidov. Struktura supramolekularnih sistemov (lipoproteini, membrane). Medatomske in medmolekularne sile. Zveza med strukturo in biološko funkcijo. Interakcije makromolekul z ligandi in regulacija biološke aktivnosti. Eksperimentalne metode za študij medsebojne odvisnosti med strukturo in funkcijo bioloških sistemov (absorpcijksa in fluorescentna spektroskopija, ultracentrifugacija in viskozimetrija, spektroskopske metode NMR in EPR, masna spektroskopija).	Structure of proteins, nucleic acids, polysaccharides. Structure of supramolecular ensembles (lipoproteins, membranes). Intra- and intermolecular forces. Relation between structure and biological function. Interactions of macromolecules with ligands and regulation of biological activity. Experimental methods for studying structure-function relationship (absorption and fluorescence spectroscopy; ultracentrifugation and viscosimetry; spectroscopic methods NMR and EPR; mass spectrometry).

Temeljni literatura in viri / Reading materials:

- Jacob N. Israelachvili. Intermolecular and Surface Forces. Elsevier. 3rd Edition 2011.
- Leake MC. Single-Molecule Cellular Biophysics. Cambridge University Press; 2013. Bengt Nőlting: "Methods in Modern Biophysics", Springer, New York, 2006.
- Roland Glaser: "Biophysics, an introduction", Springer, New York, 2012.

Cilji in kompetence:	Objectives and competences:
Glavni cilj je predstaviti strategijo in taktiko teorije in eksperimentalnih metod na področju raziskav iz molekularne biologije. Predmet je osredotočen na strukturo bioloških makromolekul in supramolekularnih sistemov kakor tudi na medatomske in medmolekularne interakcije, ki določajo značilne makromolekularne konformacije teh sistemov. Struktura bo obravnavana v navezavi z biološko funkcijo na osnovi relevantnih biofizikalnih metod raziskovanja.	The major aim of the course is to present the strategy and tactic of theoretical and experimental research in the field of molecular biophysics. The course is focused on the structure of biological macromolecules and supramolecular ensembles as well as on intra- and intermolecular interactions responsible for characteristic macromolecular conformations. Furthermore, the knowledge of structure will be related to biological function of these systems using biophysical methods.
Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Vedenje in razumevanje strukture in funkcije bioloških makromolekul in supramolekularnih sistemov.	**Knowledge and understanding:** Knowledge and understanding of structure and function of biological macromolecules and supramolecular ensembles on the molecular level.
Prenosljive/ključne spretnosti in drugi atributi: Boljše razumevanje eksperimentalnih metod v molekularni biofiziki in novih razvijajočih se eksperimentalnih metod v biomedicini.	**Transferable/key competences and other abilities:** Better understanding of experimental methods in molecular biophysics as well as of the relevant new methods developing in biomedicine.
Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja Seminarji Vaje (demonstracije eksperimentov in laboratorijsko delo) Samostojno delo (raziskovalni projekt)	Lectures Seminars Tutorial (demo and laboratory work) Individual work (research project)

Načini ocenjevanja:	Delež (v %) / Share (in %)	Assessment methods:
Način (pisni izpit, ustno izpraševanje, naloge, projekt)		Method (written or oral exam, coursework, project):
Ustni izpit	**50 %**	Oral exam
Seminarska naloga	**20 %**	Seminar paper
Projekt	**30 %**	Project

Reference nosilca / Course coordinator's references:

HAVRDOVÁ, Markéta, URBANČIČ, Iztok, BARTOŇ TOMÁNKOVÁ, Kateřina, MALINA, Lukáš, POLÁKOVÁ, Kateřina, ŠTRANCAR, Janez, BOURLINOS, Athanasios B. Intracellular trafficking of cationic carbon dots in cancer cell lines MCF-7 and HeLa—time lapse microscopy, concentration-dependent uptake, viability, DNA damage, and cell cycle profile. *International journal of molecular sciences*. 2022, vol. 23, no. 3, str. 1077-1-1077-13. ISSN 1661-6596. DOI: 10.3390/ijms23031077.

LEROUX, Mélanie, KOKOT, Boštjan, KOKOT, Hana, KOKLIČ, Tilen, ŠTRANCAR, Janez, et al. Aerosol–cell exposure system applied to semi-adherent cells for aerosolization of lung surfactant and nanoparticles followed by high quality RNA extraction. *Nanomaterials*. [Online ed.]. 2022, vol. 12, no. 8, str. 1362-1-1362-23. ISSN 2079-4991. DOI: 10.3390/nano12081362.

HAVRDOVÁ, Markéta, URBANČIČ, Iztok, BARTOŇ TOMÁNKOVÁ, Kateřina, MALINA, Lukáš, ŠTRANCAR, Janez, BOURLINOS, Athanasios B. Self-targeting of carbon dots into the cell nucleus : diverse mechanisms of toxicity in NIH/3T3 and L929 cells. *International journal of molecular sciences*. 2021, vol. 22, no. 11, str. 5608-1-5608-16. ISSN 1661-6596. DOI: 10.3390/ijms22115608.

KOKOT, Boštjan, KOKOT, Hana, UMEK, Polona, VAN MIDDEN, Katarina Petra, PAJK, Stane, ZORC, Maja, EGGELING, Christian, KOKLIČ, Tilen, URBANČIČ, Iztok, ŠTRANCAR, Janez. How to control fluorescent labeling

of metal oxide nanoparticles for artefact-free live cell microscopy. *Nanotoxicology*. 2021, vol. 15, no. 8, str. 1102-1123. ISSN 1743-5404. DOI: 10.1080/17435390.2021.1973607.

KOKOT, Hana, KOKOT, Boštjan, SEBASTIJANOVIĆ, Aleksandar, PODLIPEC, Rok, KRIŠELJ, Ana, ČOTAR, Petra, PUŠNIK, Mojca, UMEK, Polona, PAJK, Stane, URBANČIČ, Iztok, KOKLIČ, Tilen, ŠTRANCAR, Janez, et al. Prediction of chronic inflammation for inhaled particles : the impact of material cycling and quarantining in the lung epithelium. *Advanced materials*. [Online ed.]. 2020, vol. 32, no. 47, str. 2003913-1-2003913-15. ISSN 1521-4095. DOI: 10.1002/adma.202003913.

DANIELSEN, Pernille, ŠTRANCAR, Janez, UMEK, Polona, KOKLIČ, Tilen, ZORC, Maja, et al. Effects of physicochemical properties of TiO[sub]2 nanomaterials for pulmonary inflammation, acute phase response and alveolar proteinosis in intratracheally exposed mice. *Toxicology and applied pharmacology*. 2020, vol. 386, str. 114830-1- 114830-18. ISSN 0041-008X. DOI: 10.1016/j.taap.2019.114830.

URBANČIČ, Iztok, ZORC, Maja, KOKOT, Boštjan, KOKOT, Hana, UMEK, Polona, ŠKARABOT, Miha, ARSOV, Zoran, KOKLIČ, Tilen, ČEH, Miran, MUŠEVIČ, Igor, ŠTRANCAR, Janez, et al. Nanoparticles can wrap epithelial cell membranes and relocate them across the epithelial cell layer. *Nano letters*. 2018, vol. 18, no. 8, str. 5294-5305. ISSN 1530-6984. DOI: 10.1021/acs.nanolett.8b02291.