UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Fizika mehkih kompleksnih sistemov
Course title:	Soft Complex Matter Physics

Študijski program in stopnja Studyprogrammeandlevel	Študijska smer Studyfield	Letnik Academicyear	Semester Semester
FIZIKA		1. ali .2	**1. ali 2.**
PHYSICS		1. or 2.	**1. or 2.**

Vrsta predmeta / Coursetype	Izbirni za modula Biofizika in Fizika
Univerzitetna koda predmeta / Universitycoursecode:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratorywork	Mentorstvo Mentorship	Samost. delo Individ. work	ECTS
10	**5**				**165**	**6**

Nosilec predmeta / Lecturer:	Ioannis Lelidis

Jeziki / Languages:	**Predavanja / Lectures:**	angleški/English
	Vaje / Tutorial:	

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Predznanje iz klasične in moderne fizike in fizike trdne snovi.	Preknowledge of classical and modern physics and solid state physics.

Vsebina:	**Content (Syllabusoutline):**
Predavanja bodo vsebovala bazična in napredna znanja s področja fizike kompleksne mehke snovi in aplikacije. Poglavja bodo izbrana skladno z raziskovalnim delom študenta. Primeri poglavij so naslednji: statika in dinamika faznih prehodov, elastičnost in elastične nestabilnosti, fizikalne lastnosti in adsorpcija. Ilustrirane bodo ustrezne aplikacije v tekočih kristalih, koloidih, polimerih, elektrolitih in bioloških sistemih. Predstavljena bodo številne eksperimentalne meritve in analize merjenih rezultatov (impedančna spektroskopija, optične in	The lectures will cover basic and advanced topics in Soft Matter Physics, applications will be discussed. Topics may be chosen in accordance with the candidate's research work. Examples of topics: static and dynamics of phase transitions, elasticity and elastic instabilities, physical properties, adsorption. Applications in the fields of liquid crystals, colloids, polymers, electrolytes and bio-systems. Analysis of experimental measurements (impedance spectroscopy, optical and electro-optical measurements, systems under high external fields).

elektro-optične meritve, uporaba močnih električnih polj).	

Temeljni literatura in viri / Readings:

1. Chaikin, P. M., & Lubensky, T. C. (2003). Principles of condensed matter physics. Cambridge: Cambridge University Press. [COBISS.SI-ID 2956058] https://plus.cobiss.net/cobiss/si/sl/bib/pefmb/2956058

2. Selinger, J. V. (2016). Introduction to the theory of soft matter: from ideal gases to liquid crystals. Cham: Springer. [COBISS.SI-ID 22107656] https://plus.cobiss.net/cobiss/si/sl/bib/pefmb/22107656

3. De Gennes, P.-G. de, & Prost, J. (1998). The physics of liquid crystals (2nd ed., reprint). Oxford; New York: Clarendon Press. [COBISS.SI-ID 1030740] https://plus.cobiss.net/cobiss/si/sl/bib/pefmb/1030740

4. Kléman, M., & Lavrentovich, O. D. (2003). Soft matter physics: an introduction. New York [etc.]: Springer. [COBISS.SI-ID 1580644] https://plus.cobiss.net/cobiss/si/sl/bib/pefmb/1580644

5. A. Skarlatos, A. Martínez-de-Guerenu, D. J. Badiola, I. Lelidis, Interpretation of the magnetic susceptibility behaviour of soft carbon steels based on the scaling theory of second order phase transitions for systems with supercritical disorder, J. Magnetism Magnetic Mater 555, 169265 (2022). https://doi.org/10.1016/j.jmmm.2022.169265

Dodatna literatura / Additional readings:

1. Jones, R. A. L. (2014). Soft condensed matter (Corrected 2003). Oxford: Oxford University Press. [COBISS.SI-ID 29415463]

2. Russel, W. B., Saville, D. A., & Schowalter, W. R. (2001). Colloidal dispersions (Digital reprinting). Cambridge; New York: Cambridge University Press. [COBISS.SI-ID 11320584]

3. Orazem, M. E., & Tribollet, B. (2008). Electrochemical impedance spectroscopy. Hoboken: Wiley. [COBISS.SI-ID 22120231]

Cilji in kompetence:	**Objectives and competences:**
Namen predmeta je študente usposobiti za raziskovalno delo na izbranem področju fizike kondenzirane snovi.	The objective of this course is to teach students how to carry out research work on a selected field within condensed matter physics.

Predvideni študijski rezultati:	**Intended learning outcomes:**

Znanje in razumevanje:	Knowledgeandunderstanding:
Po zaključku tega predmeta bo študent zmožen: - analizirati, vrednotiti in primerjati najnovejše raziskave na izbranem področju fizike mehke snovi; - uporabiti napredno fizikalno znanje in matematične metode na danem področju za analizo in vrednotenje fizikalnih pojavov v odvisnosti od relevantnih fizikalnih parametrov in spremenljivk; - prepoznati analogije med različnimi pojavi in jih uporabiti za obravnavo novih pojavov.	On completion of this course the student will be able to: - analyse, evaluate and compare the latest research on a chosen field of soft matter physics; - use advanced physical knowledge and mathematical methods from a specific field for an analysis and evaluation of physical effects as a function of physical parameters and variables; - recognise analogies among different effects and apply them to describe novel physical effects.
Prenesljive/ključne spretnosti in drugi atributi: - *Spretnosti komuniciranja:* ustno in pisno izražanje pri predstavitvi izbrane teme. - *Uporaba informacijske tehnologije:* uporaba programskih orodij za modeliranje in obdelavo podatkov. - *Reševanje problemov:* prepoznavanje univerzalnosti, analogij in celosten pristop k reševanju problemov.	Transferable/KeySkillsandotherattributes: - *Communication skills:* manner of expression at written and oral presentation of a chosen topic. - *Use of information technology:* use of software tools for modelling and data manipulation. - *Problem solving:*ability to recognize universalities, analogies, and global approach to solving problems.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminarji, konzultacije, razlaga, razgovor, delo s tekstom, metoda pisnih in grafičnih del, problemsko učenje, študija primera, raziskovalno učenje, uporaba programskih orodij.	Lectures, seminars, tutorials, explanation, discussion, work with text, work with graphic elements, case study, problem based learning, inquiry based learning, use of software tools.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
~~Način (pisni izpit, ustno izpraševanje, naloge, projekt)~~ ~~Seminar~~ Seminarska naloga	**100%**	~~Type (examination, oral, coursework, project):~~ ~~Seminar~~ Seminar paper

Reference nosilca / Lecturer'sreferences:

1. A. Skarlatos, A. Martínez-de-Guerenu, D. J. Badiola, **I. Lelidis**, Interpretation of the magnetic susceptibility behaviour of soft carbon steels based on the scaling theory of second order phase transitions for systems with supercritical disorder, **J. Magnetism Magnetic Mater** 555, 169265 (2022). https://doi.org/10.1016/j.jmmm.2022.169265

2. G. Barbero, F. Batalioto, A. M. Figueiredo Neto, **I. Lelidis**, Deviations from linearity in impedance spectroscopy measurements confirmed by Kramers-Kronig analysis, **Electrochimica Acta** 397, 139277 (2021). https://doi.org/10.1016/j.electacta.2021.139277

3. G. Barbero, L. R. Evangelista, **I. Lelidis**, Effective adsorption energy and generalization of the Frumkin-Fowler-Guggenheim isotherm, **J Mol. Liq**. 327, 114795 (2021). https://doi.org/10.1016/j.molliq.2020.114795

4. C. Kyrou, D. Tsiourvas, S. Kralj, **I. Lelidis**, Effect of superhydrophobic nanoplatelets on the phase behavior of liquid crystals, **J. Mol. Liq**. 298, 111984 (2020). https://doi.org/10.1016/j.molliq.2019.111984

5. ~~**I. Lelidis**, E. Kume, A new flexoelectric mode in twist-bend nematic liquid crystals, **J. Mol. Liq**. 295, 111701 (2019). https://doi.org/10.1016/j.molliq.2019.111707~~