UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Računska sistemska biologija
Course title:	Computational Systems Biology

Študijski program in stopnja Study programme and level	Modul Module	Letnik Academic year	Semester Semester
Informacijske in komunikacijske tehnologije, 3. stopnja	Tehnologije znanja	1	1
Information and Communication Technologies, 3rd cycle	Knowledge Technologies	1	1

Vrsta predmeta / Course type	Izbirni / Elective
Univerzitetna koda predmeta / University course code:	IKT3-717

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
15	**15**			**15**	**105**	**5**

**Navedena porazdelitev ur velja, če je vpisanih vsaj 15 študentov. Drugače se obseg izvedbe kontaktnih ur sorazmerno zmanjša in prenese v samostojno delo. / This distribution of hours is valid if at least 15 students are enrolled. Otherwise the contact hours are linearly reduced and transfered to individual work.*

Nosilec predmeta / Lecturer:	Prof. dr. Kristina Gruden Prof. dr. Sašo Džeroski

Jeziki / Languages:	**Predavanja / Lectures:**	Slovenščina, angleščina / Slovenian, English
	Vaje / Tutorial:	

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Zaključen študij druge stopnje s področja informacijskih ali komunikacijskih tehnologij ali zaključen študij druge stopnje na drugih področjih z znanjem osnov s področja predmeta. Potrebna so tudi osnovna znanja matematike, računalništva in informatike.	Completed second cycle studies in information or communication technologies or completed second cycle studies in other fields with knowledge of fundamentals in the field of this course. Basic knowledge of mathematics, computer science and informatics is also requested.

Vsebina:	**Content (Syllabus outline):**
Uvod: Koncept sistemske biologije Eksperimentalni pristopi: Transkriptomika, proteomika, metabolomika Spremljanje dinamike bioloških sistemov Analiza 'omskih' podatkov: Postopek analize podatkov, analize podatkov posameznih platform, integrativna analiza podatkov, metode strojnega učenja v sistemski biologiji Modeliranje strukture in dinamike bioloških omrežij:	Introduction: The concept of systems biology Wetlab approaches: Transcriptomics, proteomics, metabolomics Measurements of biological systems dynamics Analysis of "omics" data: Data analysis tasks, analysis of single-platform data, integrative data analysis, machine learning and systems biology Modeling the structure and dynamics of biological networks: Types of biological networks, network

Vrste bioloških omrežij, formalizmi za modeliranje omrežij, modeliranje dinamičnih sistemov, kinetično modeliranje v sistemski biologiji Zgledi in študije primerov	modeling formalisms, modeling dynamic systems, kinetic modeling in systems biology Examples and case studies

Temeljni literatura in viri / Readings:

Izbrana poglavja iz naslednjih knjig: / Selected chapters from the following books:

- O. Demin, and I. Goryanin, *Kinetic Modelling in Systems Biology*. Chapman & Hall/CRC, 2008. ISBN 978-1-5848-8667-9
- E. Klipp, W. Liebermeister, C. Wierling, and A. Kowald. *Systems Biology: A Textbook.* Wiley-VCH, 2009. ISBN 978-3-5273-1874-2
- S. Choi, Ed. *Systems Biology for Signaling Networks*. Springer, 2010. ISBN 978-1-4419-5796-2
- S. Džeroski, B. Goethals and P. Panov, Eds. *Inductive Databases and Constraint-Based Data Mining*. Springer, 2010. ISBN 978-1-4419-7737-3

Cilji in kompetence:	**Objectives and competences:**
Cilj predmeta je seznaniti študenta s področjem sistemske biologije, vključno z metodološkimi pristopi v eksperimentalnem delu, analizi podatkov in modeliranju. Kompetence študenta z uspešno zaključenim predmetom bodo vključevale razumevanje osnovnih pojmov z obeh področij, poznavanje sodobnih metod in njihovo praktično uporabo.	The course objective is to familiarize the student with the field of systems biology, including wet and dry lab methodologies. The competencies of the students successfully completing this course include understanding of basic concepts from both areas, familiarity with state-of-the art methods, and capability of their use in practical problems.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Študenti bodo z uspešno opravljenimi obveznostmi tega predmeta pridobili: • pregled obstoječih nalog in metod sistemske biologije • sposobnost uporabe obstoječih metod na novih problemih • sposobnost ugotavljanja primernosti različnih pristopov za reševanje specifičnih problemov modeliranja bioloških sistemov	Students successfully completing this course will acquire: • an overview of existing tasks and methods in systems biology • the ability to apply existing methods to new problems • the ability to identify the best methodlogical approach availabile for solving specific problems of modeling biological systems

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminar, konzultacije, samostojno delo	Lectures, seminar, consultancy, individual work

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Ustni izpit	50 %	Oral exam
Sminarska naloga	25 %	Seminar work
Ustni zagovor seminarske naloge	25 %	Oral defense of the seminar work

Reference nosilca / Lecturer's references:

- Radivojac, P., ..., **Džeroski, S.,** et al. A large-scale evaluation of computational protein function prediction, *Nature Methods* 10(3):221-7, 2013.
- Carotenuto, M., ..., **Džeroski, S.,** et al. Neuroblastoma tumorigenesis is regulated through the Nm23-H1/h-Prune C-terminal interaction. Scientific Reports, 3:1351, 2013.

- Škunca, N., Bošnjak, M., Kriško, A., Panov, P., **Džeroski,** S., Šmuc, T. Phyletic profiling with cliques of orthologs Is enhanced by signatures of paralogy relationships. *PLOS Computational Biology*, 9(1): e1002852, 2013.
- Miljkovic, D., Stare, T., Mozetič, I., Podpečan, V., Petek, M., Witek, K., Dermastia, M., Lavrač, N., **Gruden, K.** Signalling network construction for modelling plant defence response. *PLoS ONE*, 7(12): e51822, 2012.
- Ramšak, Ž., Baebler, Š., Rotter, A., Korbar, M., Mozetič, I., Usadel, B., **Gruden, K.** GoMapMan : integration, consolidation and visualization of plant gene annotations within the MapMan ontology. *Nucleic Acids Research*, 42: D1167-D1175, 2014.