

## UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	GENOMSKA BIOLOGIJA
<b>Course Title:</b>	GENOME BIOLOGY

Študijski program in stopnja Study Programme and Level	Študijska smer Study Field	Letnik Academic Year	Semester Semester
MAG Biokemija, 2. stopnja	/	2.	3.
USP Biochemistry, 2 <sup>nd</sup> Cycle	/	2 <sup>nd</sup>	3 <sup>rd</sup>

**Vrsta predmeta / Course Type:** izbirni strokovni / Elective Professional

**Univerzitetna koda predmeta / University Course Code:** BI2106

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
30	15	30 LV	/	/	75	5

**Nosilec predmeta / Lecturer:** izr. prof. dr. Dušan Kordiš /  
Dr. Dušan Kordiš, Associate Professor

**Jeziki / Languages:**

<b>Predavanja / Lectures:</b>	slovenski / Slovenian
<b>Vaje / Tutorial:</b>	slovenski / Slovenian

**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:**

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.	Prerequisites: The course has to be assigned to the student.
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**Vsebina:**

Kaj je genom? Razumevanje genomskih zaporedij. Anatomija eukariotskih in prokariotskih genomov. Regulacija delovanja genoma. Struktura in dinamika genomov. Molekularni vzroki evolucije genomov. Vzorci genomske evolucije. Filogenetika in filogenomika. Evolucija proteinov. Laboratorijske vaje (računalnik): Genomske podatkovne baze. Specializirane proteomske databaze. Evolucijske analize genomskih sekvenc. Evolucijske analize proteomov.

**Content (Syllabus outline):**

What is a genome?  
Understanding a genome sequence.  
Genome anatomies in eukaryotes and prokaryotes.  
Regulation of genome activity.  
Molecular basis of genome evolution.  
Patterns of genome evolution.  
Molecular phylogenetics and phylogenomics.  
Protein evolution.

Laboratory work (computational):  
Genome databases.  
Protein and proteome databases.  
Evolutionary analyses of genome sequences.  
Evolutionary analyses of proteomes.

### Temeljna literatura in viri / Readings:

- Lynch, M. (2007) The Origins of Genome Architecture. Sinauer.
- Brown, T.A. (2006) Genomes. 3rd Edition, Garland Science.
- Pagel, M. and Pomiankowski, A. (2007) Evolutionary genomics and proteomics. Sinauer.

### Cilji in kompetence:

Genomska biologija je izbirni naravoslovni predmet, pri katerem študenti spoznajo organizacijo, delovanje, regulacijo in analizo celotnih genomov (prokariotskih in eukariotskih) ter mehanizme in vzorce evolucije genomov. Študenti bodo spoznali uporabnost izjemno kompleksnih genomskih podatkov pri reševanju različnih problemov iz sodobne biologije in razumevanja pomena informacij, ki so skrite v genomskih sekvencah. Sposobni bodo uporabljati specializirane genomske in proteomske podatkovne baze ter metode molekularne evolucije, ki so potrebne za analizo evolucije različnih genomskih komponent. Predmet usmerja študenta k samostojnemu eksperimentalnemu in teoretičnemu delu.

### Objectives and Competences:

Genome Biology is an elective course, during which students learn about the organization, functioning, regulation and analysis of genomes (prokaryotic and eukaryotic), as well as familiarize themselves with the mechanisms and patterns of genome evolution. Students will be taught on the key role of very complex genomic data as to solving various problems in modern biology and of the importance of information hidden in genome sequences. They will be acquainted with specialized genomic and proteomic databases and methods of molecular evolution that are needed in the evolutionary analysis of the different genomic components. Students will be prompted to do independent experimental and theoretical work.

### Predvideni študijski rezultati:

#### Znanje in razumevanje

Študent pri predmetu pridobi znanje o nastanku, strukturi organizaciji, delovanju, regulaciji in evoluciji genomov. Pridobljeno znanje omogoča študentom razumevanje izjemno kompleksnih genomskih podatkov. Študent se nauči uporabljati genomske podatkovne baze.

#### Uporaba

Študij tega predmeta je nujna podlaga za to, da bo študent razumel kako se genomi in njegove komponente spreminjajo s časom. Predstavljene raziskovalne metode bodo študenti lahko uporabljali na različnih strokovnih področjih. Pridobljeno znanje jim bo pomagalo pri uporabi izjemno kompleksnih genomskih podatkov pri reševanju različnih problemov iz sodobne biologije ter pri interpretaciji rezultatov pridobljenih iz genomskih podatkovnih baz.

### Intended Learning Outcomes:

#### Knowledge and Comprehension

Students will acquire knowledge about the origin, structural organization, functioning, regulation and evolution of genomes. This will enable them to understand the extremely complex genomic data. Students will learn how to use genomic databases.

#### Application

The course gives students the indispensable basis for the understanding of the evolution of genomes and their components. Students will be able to apply research methods presented during the course to various research fields. The acquired knowledge will help them to use the highly complex genomic data when solving various problems of modern biology, as well as to interpret the results obtained from genomic and proteomic databases.

<u>Refleksija</u> Študent pridobi sposobnost kompleksnega biološkega načina razmišljanja in razvije zmožnost abstraktne predstave o organizaciji, delovanju in evoluciji genomov.	<u>Analysis</u> Students will develop the ability to complex biological thinking, as well as the capacity for the abstraction of genome organization, functioning and evolution.
<u>Prenosljive spretnosti</u> Izkušnje pri reševanju problemov. Timsko delo (pri vajah). Zbiranje in interpretiranje rezultatov ter njihovo kritično vrednotenje. Uporaba tuje literature. Podajanje poročil o opravljenem delu.	<u>Skill-transference Ability</u> Problem-solving skills. Teamwork (at Laboratory work). Obtaining and interpreting results and their critical evaluation. Use of scientific literature. Writing reports on the practical work performed.

**Metode poučevanja in učenja:**

Predavanja, seminarji in laboratorijske vaje (računalniške)

**Learning and Teaching Methods:**

Lectures, Seminars and Laboratory work (computational)

<b>Načini ocenjevanja:</b>	Delež (v %) / Weight (in %)	<b>Assessment:</b>
Kolokvij iz vaj Pisni izpit Ocene: 6-10 (pozitivno), 1-5 (negativno).		Laboratory tutorial colloquium Written exam Grades: 6-10 (positive), 1-5 (negative)

**Reference nosilca / Lecturer's references:**

1. KOKOŠAR, Janez, **KORDIŠ**, Dušan. Genesis and regulatory wiring of retroelement-derived domesticated genes : a phylogenomic perspective. *Molecular Biology and Evolution*, 2013, vol. 30, str. 1015-1031. [COBISS.SI-ID 26492711].
2. **KORDIŠ**, Dušan. Extensive intron gain in the ancestor of placental mammals. *Biology Direct*, 2011, vol. 6, article no. 59. [COBISS.SI-ID 25309479].
3. **KORDIŠ**, Dušan, TURK, Vito. Phylogenomic analysis of the cystatin superfamily in eukaryotes and prokaryotes. *BMC Evol Biol.*, 2009, vol. 9, str. 266-1-266-22. [COBISS.SI-ID 23152679].
4. **KORDIŠ**, Dušan. Transposable elements in reptilian and avian (sauropsida) genomes. *Cytogenet. Genome Res.*, 2009, vol. 127, no. 2/4, str. 94-111. [COBISS.SI-ID 23528999].
5. NOVINEC, Marko, **KORDIŠ**, Dušan, TURK, Vito, LENARČIČ, Brigita. Diversity and evolution of the thyroglobulin type-1 domain superfamily. *Molecular Biology and Evolution*, 2006, vol. 23, str. 744-755. [COBISS.SI-ID 19851815].