

## UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	Biologija matičnih celic
<b>Course title:</b>	Biology of Stem Cells

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Nanoznanosti in nanotehnologije, 3. stopnja	Bioznanosti	1	1
Nanosciences and Nanotechnologies, 3 <sup>rd</sup> cycle	Biosciences	1	1

**Vrsta predmeta / Course type**

Izbirni / Elective

**Univerzitetna koda predmeta / University course code:**

NANO3-791

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 transferred to individual work.*

**Nosilec predmeta / Lecturer:**

Prof. dr. Tanja Dominko

**Jeziki /  
Languages:**

**Predavanja / Lectures:** Slovensko / angleško  
Slovene / English

**Vaje / Tutorial:** Slovensko / angleško

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

Predmet lahko vpišejo študentje, ki so uspešno opravili izpit iz Biologije celice na dodiplomskem ali podiplomskem študiju.

**Prerequisites:**

Students that have successfully passed the exam of Cell Biology in undergraduate or postgraduate studies can enrol.

**Vsebina:**

**I. Matične celice v razvoju in regeneraciji**

- Embriogeneza in embrionske matične celice (biokemijski in biološki procesi razvoja)
- Inducirane matične celice – indukcija pluripotence
- Matične celice v tkivnem inženirstvu

Matične celice – etika in politika

**II. Matične celice v bolezenskih stanjih**

- Potencialna uporabnost matičnih celic v raznih boleznih
- Transformacija vs. (de-)diferenciacija
- Rakave matične celice
- Proizvodi na osnovi matičnih celic – najnovejše tehnologije

**Content (Syllabus outline):**

**Biology of Stem Cells**

**I. Stem cells in development and regeneration**

- Embryogenesis and embryonic stem cells (biochemical and biological processes)
- Induced stem cells – pluripotency induction
- Stem cells in tissue engineering

Stem cells - ethics and politics

**II. Stem cells in disease**

- Potential of stem cells application in various diseases
- Transformation vs. (de-) differentiation
- Cancer stem cells
- Stem cell products - state of the art technologies

**Temeljni literatura in viri / Readings:**

- Ulrich Henning (ed): Perspectives of Stem Cells, Springer, ISBN: 978-90-481-3375-8
- Vinagolu K. Rajasekhar (ed), Mohan C Vemuri: Regulatory Networks of Stem Cells, Springer, ISBN: 978-1-60327-226-1

**Cilji in kompetence:**

- Študentje se seznanijo z osnovnimi lastnostmi različnih vrst matičnih celic
- Pridobivanje sposobnosti analiziranja in interpretacije osnovne znanstvene literature
- Razumevanje sodobnih molekularnih tehnik v raziskavah matičnih celic
- Razumevanje vloge matičnih celic v različnih bolezenskih stanjih

**Objectives and competences:**

- Students acquire knowledge of basic characteristics of different types of stem cells
- Ability to analyse and evaluate primary literature
- Understanding of modern molecular techniques in stem cell research
- Understanding the role of stem cells in different diseases

**Predvideni študijski rezultati:**

- izkazati znanje o bioloških metodah matičnih celic in molekularnih mehanizmih, ki vodijo k pluripotenci
- izkazati razumevanje molekularne biologije in biokemijskih tehnik, ki se uporabljajo pri raziskavah matičnih celic
- razviti spretnosti za vrednotenje strategij diferenciacije za aplikacije celične terapije
- izkazati razumevanje molekularnih razlik in funkcij izvornih celic, pridobljenih iz različnih virov
- analiziranje in interpretacija znanstvene literature
- razumevanje prednosti in slabosti celične terapije
- uporaba gornjega znanja za koherentno oceno terapij, ki temeljijo na matičnih celicah, gensko spremenjenih celičnih produktov in etike
- dokazati razumevanje in spoštovanje etičnih vprašanj pri terapiji z matičnimi celicami

**Intended learning outcomes:**

- Demonstrate knowledge of stem cell biology and molecular mechanisms leading to pluripotency
- Demonstrate an understanding of molecular biology and biochemistry techniques used in stem cell research
- Develop skills to evaluate differentiation strategies for cell therapy applications
- Demonstrate understanding of molecular differences and functions of stem cells derived from different sources
- Master analysis and interpretation of primary scientific literature
- Understand advantages and disadvantages of cell based therapeutics
- Apply the above knowledge for coherent appraisal of stem cell-based therapies and genetically modified cell based products and ethics
- Demonstrate an understanding and appreciation for ethical issues in stem cell therapy

**Metode poučevanja in učenja:**

- Osnove predmeta, podane v sklopu predavanj
- Posamezna vroča poglavja študentje samostojno obdelajo v obliki seminarja
- Samostojni projekt

**Learning and teaching methods:**

- Lectures on subject basics
- Student seminar preparation on certain currently hot topics
- Independent project

Delež (v %) /

**Načini ocenjevanja:**

Weight (in %)

**Assessment:**

• Ustni izpit iz splošnega dela	20 %	• Oral exam of the basic theoretical part
• Ocena od seminarja	30 %	• Seminar assessment
• Samostojni projekt	50 %	• Independent project

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

- Kole D, Ambady S, Page RL and Dominko T (2014). Maintenance of Multipotency in Human Dermal Fibroblasts Treated with *Xenopus laevis* Egg Extract Requires Exogenous Fibroblast Growth Factor-2., *Cell Reprogram.* 2014 Feb;16(1):18-28. doi: 10.1089/cell.2013.0066. Epub 2014 Jan 3.
- Jez M, Ambady S, Kashpur O, Grella A, Malcuit C, Vilner L, Rozman P and Dominko T (2014). Expression and Differentiation between OCT4A and Its Pseudogenes in Human ESCs and Differentiated Adult Somatic Cells, *Plos One*, DOI: 10.1371/journal.pone.0089546.
- Dolivo, D., Hernandez, S., and Dominko, T. (2016) Cellular Lifespan and Senescence: A Complex Balance Between Multiple Cellular Pathways. *BioEssays* 38 Suppl 1:S33-44. doi: 10.1002/bies.201670906. Review. PMID:27417120
- Hernandez SJ, Dolivo DM, Dominko T. (2017) PRMT8 demonstrates variant-specific expression in cancer cells and correlates with patient survival in breast, ovarian and gastric cancer. *Oncol Lett.* 2017 Mar;13(3):1983-1989. doi: 10.3892/ol.2017.5671. Epub 2017 Feb 1. PMID:28454353
- Kole D, Grella A, Dolivo D, Shumaker L, Hermans W, Dominko T. (2017) High molecular weight FGF2 isoforms demonstrate canonical receptor-mediated activity and support human embryonic stem cell self-renewal. *Stem Cell Res.* 2017 May;21:106-116. doi: 10.1016/j.scr.2017.04.006. Epub 2017 Apr 18. PMID:28433654