Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Matematika v interdisciplinarnem inovacijskem procesu
Course title:	Mathematics in interdisciplinary innovation process

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Enovit magistrski študijski program druge stopnje Predmetni učitelj	**/**	**3. ali/or 4.**	**6. ali /or 8.**
Five-year master's degree program Subject Teacher	**/**		

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

Predavanja **Lectures**	**Seminar** **Seminar**	**Sem. vaje** **Tutorial**	**Lab. vaje** **Laboratory work**	**Teren. vaje** **Field work**	**Samost. delo** **Individ. work**	**ECTS**
15	**15**		**15**		**45**	**3**

Nosilec predmeta / Lecturer:	Drago Bokal

Jeziki / Languages:	**Predavanja / Lectures:**	SLOVENSKO/SLOVENE
	Vaje / Tutorial:	SLOVENSKO/SLOVENE

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Jih ni.	None

Vsebina:

- Inovacijski proces od ideje prek raziskav in razvoja do izdelka ali storitve.
- Osredotočanje na uporabnika: dizajnersko razmišljanje.
- Matematično modeliranje v procesu inoviranja.
- Sodelovanje matematičnega izobraževanja v inovacijskem procesu.
- Pregled uporabe matematike v zdravstvu, biologiji, energetiki, okoljevarstvu, finančnem modeliranju, avtomobilski industriji in proizvodnji, elektroniki, letalskih in vesoljskih tehnologijah, storitvenih dejavnostih, transportu, logistiki.
- Izobraževalne institucije v inovacijskem procesu.
- Viri financiranja razvojnih dejavnosti.
- Viri financiranja izobraževalnih institucij.
- Individualne razpisne prijave.
- Konzorcijske razpisne prijave.

Content (Syllabus outline):

- Innovation process from ideas through research and development to products and services.
- Focusing on the user: design thinking.
- Mathematical modeling in the innovation process.
- The role of mathematics education in innovation processes.
- Brief overview of applying mathematics in health, biology, energy sector, environmental protection, financial modeling, automotive industry, manufacturing, electronics, aerospace, service, transport, logistics.
- Educational institutions in innovation processes.
- Funding sources for research and development.
- Funding sources for educational institutions.
- Single partner grant applications.
- Consortium grant applications.

Temeljni literatura in viri / Readings:

T. Lery et al.: European Success Stories in Industrial Mathematics, Springer, Heidelberg, 2012

S. K. Houston, I. D. Huntley: Teaching and Learning Mathematical Modelling (Ictma 7): Innovation, Investigation and Application, Woodhead Publishing, Cambridge, 1997

T. Lockwood: Design Thinking: Integrating Innovation, Customer Experience, and Brand Value, Allworth press, New York, 2009

D. R. Shier, K.T. Wallenius: Applied Mathematical Modeling: A Multidisciplinary Approach, Chapmann & Hall/CRC, London, 1999.

Cilji in kompetence:

Razumeti vlogo matematike v inovacijskih procesih v sodobni družbi znanja.

Spoznati uspešne primere uporabe matematike pri reševanju sodobnih izzivov.

Spoznati primere dobre prakse vključevanja matematičnega izobraževanja v inovacijski proces.

Objectives and competences:

Understand the role of mathematics in innovation processes of the modern knowledge society.

Understand successfull examples of applying mathematics to challenges of the modern society.

Understand best practices of involving mathematical education in innovation processes.

Spoznati načine financiranja raziskovalnih in razvojnih projektov. Usvojiti znanje, potrebno za pripravo individualnih in konzorcijskih razpisnih prijav. Usvojiti kompetence, potrebne za spoznavanje potencialnih delodajalcev preko sodelovanja na razpisnih prijavah.	Familiarize with funding sources for research and development projects. Gain knowledge required to apply for grants either as a single partner or as a consortium. Gain competences, required to contact potential employers through collaboration in grant applications.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: • Razumevanje inovacijskih procesov in vloge matematike ter matematičnega izobraževanja v njih. • Poznavanje dobrih praks vključevanja matematičnega izobraževanja v inovacijski proces. • Razumevanje načinov financiranja raziskovalnih in razvojnih aktivnosti. Prenesljive/ključne spretnosti in drugi atributi: • Priprava raziskovalnih nalog za učence in dijake, ki so vpete v inovacijske procese. • Priprava individualnih ali konzorcijskih prijav na aktualne domače ali mednarodne razpise.	Knowledge and Understanding: • Understanding of innovation processes and the role of mathematics and mathematical education in such processes. • Understanding of best practices of involving mathematical education in innovation processes. • Understanding funding of the research and development activities. Transferable/Key Skills and other attributes: • Preparing research projects for primary and high school pupils. • Preparing single-partner and consortium grant applications for national and international calls.
Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Seminarske vaje • Izdelava seminarske naloge	• Lectures • Tutorial • Seminar (project) work

Načini ocenjevanja:		**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt) Seminarska naloga Ustni izpit Vsaka izmed naštetih obveznosti mora biti opravljena s pozitivno oceno.	Delež (v %) / Weight (in %) 80%, 20%	Type (examination, oral, coursework, project): Coursework report Oral exam Each of the mentioned commitments must be assessed with a passing grade.

Pozitivna ocena pri seminarski nalogi je pogoj za pristop k izpitu.		Passing grade of the seminar exercise is required for taking the exam.
Reference nosilca / Lecturer's references:		

1. PISANSKI, Tomaž, KAUFMAN, Matjaž, BOKAL, Drago, KIRBY, Edward C., GRAOVAC, Ante. Isoperimetric quotient for fullerenes and other polyhedral cages. J. chem. inf. comput. sci., 1997, let. 37, št. 6, str. 1028-1032.

2. BOKAL, Drago, FIJAVŽ, Gašper, HAREJ, Bor, TARANENKO, Andrej, ŽAGAR, Klemen. A modular hybrid approach to employee timetabling. V: 7th International Conference on the Practice and Theory of Automated Timetabling - PATAT 2008, Université de Montréal, August 18 - 22, 2008. Complete program. Montréal: Université de Montréal, 2008, 12 str. http://w1.cirrelt.ca/~patat2008/PATAT_7_PROCEEDINGS/Papers/Fijavz-HA3b.pdf. [COBISS.SI-ID 14940249]

3. BOKAL, Drago, JAGRIČ, Timotej, BRATUŠA, Dušanka, COLJA, Sara, DONAJ, Gregor, VEIT, Barbara, ZEMLJIČ, Sara Sabrina, ŽUNKO, Matjaž. Modeliranje likvidnostnega tveganja banke - primer stabilnih vpoglednih vlog gospodarstva, gospodinjstev in ostalih : zaključno poročilo projekta. Maribor; Fakulteta za naravoslovje in matematiko: Ekonomsko-poslovna fakulteta, Institut za ekonomsko diagnozo in prognozo, 2009. 17 f., graf. prikazi, tabele. [COBISS.SI-ID 9933596]

4. LOZEJ, Miran, GOLOB, Damjan, VRTIČ, Bojan, BOKAL, Drago. Pressure distribution on sail surfaces in real sailing conditions. V: Fourth High Performance Yacht Design Conference, 12-14 March 2012, Auckland, New Zealand. HPYD 4. [S. l.]: The Royal Institution of Naval Architects, 2012, 10 str. [COBISS.SI-ID 25805095]

5. GOLOB, Damjan, PLEŠKO, Mark, VRTIČ, Bojan, LOZEJ, Miroslav, BOKAL, Drago, ŽAGAR, Klemen. Sistem za merjenje tlaka na jadru, oblike jadra in metoda za določanje potisne sile : patentna prijava P-201100414. Ljubljana: Urad RS za intelektualno lastnino, 17. jan. 2012. [COBISS.SI-ID 25850663]