Univerza *v Ljubljani*
Pedagoška fakulteta

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UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	EPTE Matematika
Course title:	EPTE Mathematics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Razredni pouk		**3., 4.**	**5., 6., 7., 8.**
Primary Teacher Education		**3rd, 4th**	**5th, 6th, 7th, 8th**

Vrsta predmeta / Course type   Izbirni C in D, Elective C and D

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
24			**6**		**120**	**5**

Nosilec predmeta / Lecturer: T. Hodnik Čadež (lecturers are also guest teachers – EPTE experts: Krister Odmark, João Sampaio Maia, Beata Głodznik, Miroslava Sovičová, Gabriela Pavlovičová)

Jeziki / Languages:	**Predavanja / Lectures:**	Slovenski, angleški/ Slovene, English
	Vaje / Tutorial:	Slovenski, angleški/ Slovene, English

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

Znanje angleščine na stopnji B2

Prerequisits:

English B2

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Vsebina:

Odkrivanje matematike
Razvoj pojma število, izbrani pojmi v geometriji v preteklosti in danes. Reprezentacije matematičnih idej (didaktični materiali) skozi čas. Veliki matematiki, njihova življenja in odkritja.

Zahtevni pojmi v matematiki
Zahtevni pojmi v matematiki – pojmi, katerih reprezentacije so zelo kompleksne, lahko tudi nemogoče. Nekaj primerov: operacije z ulomki, število 0, računski zakoni, procenti, struktura števil, elementarne računske operacije, hierarhija v geometriji (geometrijske oblike, dimenzije geometrijskih objektov, merjenje).

Reševanje problemov
Opredelitev matematičnih problemov. Vloga didaktičnih sredstev in strategij pri reševanju problemov. Matematizacija oz. razvijanje matematičnega jezika. Horizontalna (od problemov do matematike in nazaj) in vertikalna matematizacija (glede na tri nivoje: neformalen, semi-formalen in formalen jezik).

Content (Syllabus outline):

Course 1 Re-inventing mathematics
The development of number concepts, some concepts in geometry in the past and nowadays. Representing mathematical ideas (learning materials) throughout times. Great mathematicians and their lives and discoveries.

Course 2 Thresholds in mathematics
Thresholds as difficult concepts in mathematics (representations for those concepts are sometimes impossible or very complex). Some examples: operations with fractions, number 0, unitizing, distributive law, percentage, structure of the numbers, elementary addition and subtraction, hierarchy in geometry (concepts of shapes, growing dimensions in space and in measures).

Course 3 Problem solving
Problems. Learning materials and strategies for problem-solving. Mathematization and mathematics language. Horizontal (from the problem to the mathematics and back) and vertical mathematization (according to the three levels: informal, semi-formal, formal).

Temeljni literatura in viri / Readings:

FOSNOT, C. T. and Dolk, M. (2001) *Constructing number sense, addition and subtraction.* Portsmouth, Heineman

FOSNOT, C. T. and Dolk, M. (2001) *Constructing multiplication and division.* Portsmouth, Heineman

Book of selected research paper – around 300 pages (we choose relevant research papers) which is updated every year.

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Cilji in kompetence:	Objectives and competences:
Cilji **Študent** • izkaže znanje o zgodovini razvoja pojma število in o različnih reprezentacijah tega pojma skozi čas; • pozna in razlikuje platonska, neplatonska in Arhimedova geometrijska telesa; • pozna razvoj pojmov iz merjenja v zgodovini; • spremlja otroke pri odkrivanju matematike; • interpretira in primerja različne učne načrte za matematiko; • pozna zahtevnejše pojme v matematiki; • razvije učne pristope za poučevanje in preseganje zahtevnih pojmov; • prepozna, poda in rešuje matematične probleme; • diskutira in vrednosti različne strategije reševanja problemov; • komunicira in reflektira (poučevanje) matematike.	**Objectives** The student is able to: • demonstrate knowledge of the history of number concepts and about number representations; • demonstrate knowledge about platonic, non-platonic and Archimedes solids; • demonstrate knowledge about the history of measurement; • accompany children to re-invent mathematics; • interpret and compare different curricula; • recognize thresholds/landmarks; • develop teaching approach for children to overcome thresholds/ landmarks; • recognize, put and solve problems; • discuss and evaluate strategies for problem solving with students and children; • communicate and reflect about mathematics.
Splošne kompetence: • Poznati spremembe v izobraževanju v evropskih državah in doma. • Poznati skupne temelje evropskega izobraževanja. • Izboljšati znanje angleškega jezika. • Izboljšati veščine medkulturnega sodelovanja. • Razviti veščine pojasnjevanja, utemeljevanja in reševanja problemov. • Razvijati kritično mišljenje. • Razvijati toleranco. • Razvijati svoje znanje in omogočati/dopuščati drugim (učencem), da razvijajo svojega.	**Generic competences:** The student is able to: • reveal changes in education in European countries and in home education • identify the common ground for European education • improve language skills • improve intercultural skills • to develop aptitudes for reasoning and a problem-solving way of thinking • develop critical thinking • develop tolerance build his/her own knowledge and let his/her pupils build their own knowledge

Specifične kompetence:

Odkrivanje matematike

- Poznati zgodovino matematike (ključne vsebine oz. razvoj pojmov: število 0, matematiki v EPTE sodelujočih državah in njihovo delo, ženske matematičarke, neskončnost, decimalna števila, ulomki, ploščina, evklidska, ne-evklidska geometrij).
- Razumeti matematiko kot človekovo dejavnost, ki je potrebna in zanimiva za vse.

Zahtevni pojmi v matematiki

- Razumeti in argumentirati zahtevne pojme v matematiki v nacionalnem in mednarodnem kontekstu.
- Konstruirati probleme za učence, ki jim pomagajo pri razumevanju zahtevnejših pojmov in načrtovati dobro poučevanje (učne pristope) teh pojmov.

Reševanje problemov

- Razviti in analizirati meta-kognitivne procese in strategije, ki so pomembni pri reševanju problemov (npr. posploševanje v algebri na osnovi primerov iz aritmetike).

Specific competences:

Course 1 **Re-inventing mathematics**

- to Know the history of mathematics (essential topics: 0, some mathematicians of participating country and their work, women mathematicians, infinity, decimal numbers, fractions, area, Euclidian – non Euclidean geometry)
- to understand mathematics as a human activity, necessary, interesting and fascinating for all

Course 2 **Thresholds in mathematics**

- to understand the idea of thresholds in mathematics from different perspectives (international and national) and to give arguments for them;
- to construct problems for children to get over the thresholds and to plan good education on those topics.

Course 3 **Problem solving**

- To develop and analyze meta-cognitive processes of solving problems and the strategies used (for example to experience thresholds from arithmetic examples to generalization in algebra)

Predvideni študijski rezultati:

Znanje in razumevanje:

Odkrivanje matematike

Študent:

- Razloži, analizira in predstavi zgodovinsko ozadje razvoja nekaterih matematičnih pojmov (npr. število 0, neskončno…).
- Pojasni odkritja v matematiki s primeri.

Knowledge and understanding:

Course 1 Re-inventing mathematics

The student is able to

- explain analyses and present history background of some essential mathematical concepts (example: number 0, infinity…).
- describe discoveries of mathematicians by demonstrating with examples

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Zahtevni pojmi v matematiki
Študent:
- Pojasni zahtevne matematične pojme pri poučevanju matematike države gostiteljice EPTE matematike.
- Pojasni razlike in podobnosti poučevanja matematike (poudarek na zahtevnih matematičnih pojmih) v njegovem izobraževalnem sistemu in v sistemu države gostiteljice.
- Izdela materiale za učenje, kontekste in kontekstualne probleme za učenje in poučevanje zahtevnih matematičnih pojmov.
- Razvije učne enote za poučevanje zahtevnih matematičnih pojmov.
- Razlikuje in zna uporabiti tri nivoje učenja in poučevanja matematike: neformalen, semi-formalen in formalen.

Reševanje problemov
Študent:
- Demonstrira veščine reševanja problemov, uporabo različnih strategij, oblikuje problemske situacije, poišče posplošitev, identificira znanje, ki je potrebno za reševanje problemov, izbere ustrezno reprezentacijo za problemsko situacijo…
- Spodbuja, aktivno spremlja učenca pri horizontalnem in vertikalnem matematiziranju.

Course 2 Thresholds in mathematics
The student is able to
- describe a part of the mathematical learning landscape including the thresholds of the guest country;
- describe differences and similarities between the landscape of his own country and that of the guest country;
- build some learning materials, contexts and context problems to allow primary school pupils to obtain the respective landmarks/thresholds;
- develop a series of lessons to allow his pupils to obtain a landmark in the mathematical landscape;
- distinguish the three levels in the learning process: informal, semi-formal and formal.

Course 3 Problem solving
The student is able to
- demonstrate problem-solving skills for finding the strategy: formulating a problem, comprehending a problem, finding patterns, identifying knowledge needed for solving problems, making conjectures, generalizing, choosing appropriate representation of a problem, proving…
- accompany children in horizontal and vertical mathematization

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Metode poučevanja in učenja:	**Learning and teaching methods:**
Aktivno in sodelovalno učenje, ustvarjanje okolja za učenje, posameznikom prilagojene zaposlitve.	Active and collaborative learning, building a learning community, personalizing tasks

Načini ocenjevanja:	**Delež (v %) / Weight (in %)**	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt) Študent izdela portfolio, ki vključuje:		Type (examination, oral, coursework, project): The student makes a portfolio including:
• dnevnik refleksij, ki predstavlja odgovore na izzive predmeta ter osebne in profesionalne ocene izkušenj pri predmetu,	50 %	• reflective diary in response to challenges of the module, and to the personal and professional value of the experience,
• prezentacije, seminarsko delo, samorefleksija, izdelava materialov za poučevanje in učenje, učne priprave (3-5), refleksija izkušenj s prakse.	50 %	• presentation, seminar work, self-evaluation, learning material, lesson plans (3 - 5) and reflection on teaching practice.

Reference nosilca / Lecturer's references:

HODNIK ČADEŽ, Tatjana, MANFREDA KOLAR, Vida. An analysis of the role of didactic material for teaching and learning of mathematical concepts. *Pedagoš. obz.*, 2009, letn. 24, št. 1, str. 52-75. [COBISS.SI-ID 7854153]

MANFREDA KOLAR, Vida, HODNIK ČADEŽ, Tatjana. Didactic material as a mediator between physical manipulation and thought processes in learning mathematics. V: MAJ, Božena (ur.), SWOBODA, Ewa (ur.), TATSIS, Konstantinos (ur.). *Motivation via natural differentiation in mathematics*. Rzseszów: Wydawnicteo Uniwersytetu, cop. 2010, str. 342-353. [COBISS.SI-ID 8426825]

MANFREDA KOLAR, Vida, HODNIK ČADEŽ, Tatjana. Analysis of inductive reasoning in mathematical problem solving among primary teacher students. V: PAVLEKOVIĆ, Margita (ur.). *The Third International Scientific Colloquium Mathematics and Children, Osijek, March 18, 2011 : (The Math Teacher) : monography : (Učitelj matematike) : monografija*. Zagreb: Element, 2011, str. 49-63. [COBISS.SI-ID 8726345]