UČNI NAČRT PREDMETA / COURSE SYLLABUS			
Predmet:	Analiza 3		
Course title:	Analysis 3		

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Enoviti magistrski študijski program Pedagoška matematika	ni smeri	3	prvi
Integrated Master's study programme Pedagogical Mathematics	none	3	first

Vrsta predmeta / Course type	obvezni
Univerzitetna koda predmeta / University course code:	M0518

Predavanja **Lectures**	**Seminar** **Seminar**	**Vaje** **Tutorial**	**Klinične vaje** **work**	**Druge oblike študija**	**Samost. delo** **Individ. work**	**ECTS**
45		**45**			**90**	**6**

Nosilec predmeta / Lecturer:	prof. Barbara Drinovec Drnovšek, prof. Miran Černe, prof. Pavle Saksida

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski/Slovene
	Vaje / Tutorial:	slovenski/Slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Opravljeni predmeti Analiza 1, Analiza 2a.	Completed courses Analysis 1, Analysis 2a.
Vsebina:	**Content (Syllabus outline):**

Uvod: Diferencialna enačba 1. reda, fazni prostor, vektorska polja na faznem prostoru, integralske krivulje vektorskih polj. Osnovni primeri diferencialnih enačb. Prvi integral enačbe. Parametrično reševanje in singularne rešitve. Clairoteva enačba. Primeri uporabe. Obstoj rešitev in njihova odvisnost od začetnih pogojev. Splošna rešitev. Tok navadne diferencialne enačbe prvega reda. Sistemi linearnih diferencialnih enačb prvega reda. Linearizacija v okolici rešitve. Tok homogenega sistema linearnih enačb. Liouvillova formula. Reševanje sistemov s konstantnimi koeficienti. Reševanje linearne enačbe višjega reda s konstantnimi koeficienti. Vsiljeno oziroma dušeno nihanje. Singularne točke linearnega sistema. Osnove teorije stabilnosti. Variacijski račun: Nekaj primerov variacijske naloge. Pojem Banachovega prostora. Linearni operatorji med Banachovimi prostori. Odvod operatorja med Banachovima prostoroma. Stacionarne točke funkcionala. Osnovni izrek variacijskega računa. Euler-Lagrangeeva enačba in njeno reševanje. Legendrova transformacija in kanonski sistem. Naloga s prostima krajiščema. Izoperimetrična naloga. Lagrangeeva naloga		Introduction: first-order differential equations, phase space, vector fields, integral curves. Examples of the first order differential equations. Exact equation and integrating factors. Singular solutions and parametric solutions. Clairot equation. Examples. Existence uniqueness theorem and dependence of the solutions on the initial conditions. General solution. Flow of the ordinary differential equation. First-order system of differential equations. Linearization. Flow of a homogenuous system of linear differential equations. Liouville formula. System with constant coefficients. Higher order linear differential equations with constant coefficients. Forced and damped oscillations. Singular points of a linear system. Stability. Calculus of variations. Some examples. Banach space and linear operators on Banach spaces. Derivatives of the operators on Banach spaces. Extremals. Fundamental theorem of calculus of variations. Euler-Lagrange equation and its solution. Legendre transformation and the canonical system. Variable end-point problems. Isoparametric problem. Lagrange problem.

Temeljni literatura in viri / Readings:

F. Križanič: Navadne diferencialne enačbe in variacijski račun, DZS, Ljubljana, 1974.

E. Zakrajšek: Analiza III, DMFA-založništvo, Ljubljana, 2002.

V. I. Arnold: Ordinary Differential Equations, MIT Press, Cambridge, 1978.

W. Walter: Ordinary Differential Equations, Springer, New York, 1998.

S. Lefschetz: Differential Equations : Geometric Theory, 2nd edition, Dover Publications, New York, 1977.

L. Perko: Differential Equations and Dynamical Systems, 3rd edition, Springer, New York, 2004.

Cilji in kompetence:

Študent se seznani s pojmom diferencialne enačbe in njene rešitve. Nauči se reševati oziroma obravnavati nekatere tipe navadnih diferencialnih enačb s posebnim poudarkom na linearnih enačbah. Spozna se z osnovami variacijskega računa, pri čemer se sreča tudi s pojmom odvoda operatorja med Banachovima prostoroma.

Objectives and competences:

The student is introduced to the concept of differential equations and their solutions. Learning to solve or treat certain types of ordinary differential equations with special emphasis on linear equations. They learn the basics of calculus of variations and with the concept of the derivative of the operator between Banach spaces.

Predvideni študijski rezultati:

Znanje in razumevanje: Razumevanje pojma diferencialne enačbe in njene rešitve. Obvladanje postopkov za analitično reševanje nekaterih tipov diferencialnih enačb. Razumevanje koncepta variacijske naloge.
Uporaba: Formulacija nekaterih problemov iz matematike, naravoslovja in družboslovja v obliki diferencialnih enačb ter njihovo reševanje. Formulacija nekaterih matematičnih in fizikalnih problemov v obliki variacijske naloge ter reševanje teh nalog.

Refleksija: Razumevanje teorije na podlagi primerov in uporabe.

Prenosljive spretnosti – niso vezane le na en predmet: Identifikacija in reševanje problemov. Formulacija nekaterih nematematičnih problemov v matematičnem jeziku. Spretnost uporabe domače in tuje literature.

Intended learning outcomes:

Knowledge and understanding:
Understanding the concept of differential equations and their solutions. Handling analytical procedures for solving certain types of differential equations. Understanding the concept of variational calculus.

Application: The formulation of some problems in mathematics, natural sciences and social sciences in the form of differential equations and solving them. Formulation of some mathematical and physical problems in the form of variational calculus and solving them.

Reflection: Understanding of the theory from the applications.

Transferable skills: Identifying and solving problems. Formulation of some non mathematical problems in mathematical language. Ability to use domestic and foreign literature.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, vaje, domače naloge, konzultacije	Lectures, exercises, homework, consultations

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt): 2 kolokvija namesto izpita iz vaj, izpit iz vaj, izpit iz teorije ocene: 5 (negativno), 6-10 (pozitivno) (ob upoštevanju Statuta UL)	50% 50%	Type (examination, oral, coursework, project): 2 midterm exams instead of written exam, written exam oral exam grading: 5 (fail), 6-10 (pass) (according to the Statute of UL)

Reference nosilca / Lecturer's references:

Miran Černe:

– ČERNE, Miran. Nonlinear Riemann-Hilbert problem for bordered Riemann surfaces. American journal of mathematics, ISSN 0002-9327, 2004, vol. 126, no. 1, str. 65-87 [COBISS.SI-ID 12895577]

– ČERNE, Miran, FLORES, Manuel. Some remarks on Hartogs' extension lemma. Proceedings of the American Mathematical Society, ISSN 0002-9939, 2010, vol. 138, no. 10, str. 3603-3609 [COBISS.SI-ID 15696473]

– ČERNE, Miran, ZAJEC, Matej. Boundary differential relations for holomorphic functions on the disc. Proceedings of the American Mathematical Society, ISSN 0002-9939, 2011, vol. 139, no. 2, str. 473-484 [COBISS.SI-ID 15710553]

Barbara Drinovec Drnovšek:

– DRINOVEC-DRNOVŠEK, Barbara. Proper discs in Stein manifolds avoiding complete pluripolar sets. Mathematical research letters, ISSN 1073-2780, 2004, vol. 11, no. 5-6, str. 575-581 [COBISS.SI-ID 13311065]

– DRINOVEC-DRNOVŠEK, Barbara, FORSTNERIČ, Franc. Approximation of holomorphic mappings on strongly pseudoconvex domains. Forum mathematicum, ISSN 0933-7741, 2008, vol. 20, iss. 5, str. 817-840 [COBISS.SI-ID 15078745]

– DRINOVEC-DRNOVŠEK, Barbara, FORSTNERIČ, Franc. Strongly pseudoconvex domains as subvarieties of complex manifolds. American journal of mathematics, ISSN 0002-9327, 2010, vol. 132, no. 2, str. 331-360 [COBISS.SI-ID 15549529]

Pavle Saksida:

– SAKSIDA, Pavle. Maxwell-Bloch equations, C Neumann system and Kaluza-Klein theory. Journal of physics. A, Mathematical and general, ISSN 0305-4470, 2005, vol. 38, no. 48, str. 10321-10344 [COBISS.SI-ID 13802073]

– SAKSIDA, Pavle. Lattices of Neumann oscillators and Maxwell-Bloch equations. Nonlinearity, ISSN 0951-7715, 2006, vol. 19, no. 3, str. 747-768 [COBISS.SI-ID 13932377]

– SAKSIDA, Pavle. On zero-curvature condition and Fourier analysis. Journal of physics. A, Mathematical and theoretical, ISSN 1751-8113, 2011, vol. 44, no. 8, 085203 (19 str.) [COBISS.SI-ID 15909465]