UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2016/17)			
Predmet:	Mehanika kontinuuma		
Course title:	Continuum mechanics		

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Magistrski študijski program Matematika	ni smeri	1 ali 2	prvi ali drugi
Master's study programme Mathematics	none	1 or 2	first or second

Vrsta predmeta / Course type	izbirni / elective
Univerzitetna koda predmeta / University course code:	M2121

Predavanja **Lectures**	**Seminar** **Seminar**	**Vaje** **Tutorial**	**Klinične vaje** **work**	**Druge oblike študija**	**Samost. delo** **Individ. work**	**ECTS**
30	**15**	**30**			**105**	**6**

Nosilec predmeta / Lecturer:	prof. dr. Igor Dobovšek

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Vpis v letnik študija.	Enrolment in the programme.
Vsebina:	**Content (Syllabus outline):**

Osnove tenzorske analize. Krivuljne koordinate, metrični tenzor, kovariantne in kontravariantne komponente. Christoffelovi simboli. Diferencialni operatorji v krivuljnih koordinatah. Odvodi tenzorskih funkcij. Kinematika kontinuuma. Deformacijski gradient. Polarni razcep deformacijskega gradienta. Mere deformacije, deformacijski tenzor. Homogena deformacija, razteg, strig. Deformacija ločnega, površinskega in volumskega elementa. Lagrangeev in Eulerjev opis gibanja. Materialni odvod. Transportni izreki. Ohranitveni zakoni. Zakon o ohranitvi mase. Napetostni tenzor. Enačba gibanja. Zakon o ohranitvi energije. Osnovni konstitutivni principi. Konstitutivne zveze. Princip materijalne objektivnosti. Materijalne simetrije, izotropija. Reprezentacija konstitucijskih funkcij. Pregled osnovnih modelov. Definicije elastičnosti, viskoelastičnosti in fluidov.	Introduction to tensor analysis. Convected coordinates, metric tensor, covariant and contravariant components. Christoffel symbols. Differential operators in convected coordinates. Derivatives of tensor functions. Kinematics of continuum. Deformation gradient. Polar decomposition of deformation gradient. Deformation measures. Strain tensor. Homogeneous deformation. Stretch and shear. Deformation of arc, surface and volume element. Motion. Lagrangian and Eulerian description. Material time derivative. Transport theorems. Balance laws. Conservation of mass. The stress tensor. Balance of momentum. Conservation of energy. Basic principles of constitutive theories. Constitutive relation. Principle of material objectivity. Material symmetry. Representation of constitutive functions. Overview of basic models. Definitions of elasticity, viscoelasticity and fluids.

Temeljni literatura in viri / Readings:

P. Chadwick: Continuum Mechanics : Concise Theory and Problems, 2nd edition, Dover Publications, Mineola, 1999.

M. E. Gurtin: An Introduction to Continuum Mechanics, Academic Press, New York-London, 1981.

I-S.Liu: Continuum Mechanics, Springer, NewYork, 2002.

J.L. Wegner, J. B. Haddow: Elements of Continuum Mechanics and Thermodynamics, Cambridge University Press, NewYork, 2009.

Cilji in kompetence:	**Objectives and competences:**

Predstavitev osnovnih pojmov in vsebin mehanike kontinuuma s poudarkom na korektni matematični formulaciji in povezovanju predhodno osvojenih matematičnih znanj.	An overview of fundamental facts and ingredients of continuum mechanics with emphasis on strict mathematical formulation based on previously mastered mathematical knowledge.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Poznavanje in razumevanje osnovnih pojmov in principov mehanike kontinuuma. Uporaba: Osnova za nadaljnje raziskovalno delo in specialistični študij na področju mehanike. Refleksija: Povezovanje osvojenega matematičnega znanja v okviru enega predmeta in njegova uporaba na področju mehanike. Prenosljive spretnosti – niso vezane le na en predmet: Celovit pogled na mehaniko kontinuuma v okviru matematičnih sredstev, ki jih študent spozna tokom študija pri tem in ostalih predmetih. Reševanje problemov iz sorodnih področij uporabne matematike.	Knowledge and understanding: To establish knowledge and understanding of fundamental principles of continuum mechanics. Application: Mastered coursework represents a foundation for specialized research in the field of mechanics. Reflection: Connecting acquired mathematical knowledge within the course with application of that knowledge in a general field of mechanics. Transferable skills: An overview of continuum mechanics within the realm of mathematical apparatus mastered by student during this and other related courses. Solving problems from related areas of applied mathematics.

Metode poučevanja in učenja:	**Learning and teaching methods:**
predavanja, vaje, domače naloge, konzultacije, seminar	Lectures, exercises, homeworks, consultations, seminar

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt): Ustni in pisni zagovor teoretičnega dela vključno s seminarskimi nalogami.Končna ocena je kombinacija navedenega zgoraj. Ocene: 1-5 (negativno), 6-10 (pozitivno) (po Statutu UL)	100%	Type (examination, oral, coursework, project): Oral and written defense of theoretical part including seminar assignments.Grade is combination of the above. Grading: 1-5 (fail), 6-10 (pass) (according to the Statute of UL)

Reference nosilca / Lecturer's references:

DOBOVŠEK, Igor. The influence of dislocation distribution density on curvature and interface stress in epitaxial thin films on a flexible substrate. V: Advances in Modeling and Evaluation of Materials in Honor of Professor Tomita : a symposium to mark the occasion of Prof. Tomita's retirement from Kobe University, (International journal of mechanical sciences, ISSN 0020-7403, Vol. 52, iss. 2, 2010). Oxford [etc.]: Pergamon Press, 2010, issue 2, vol. 52, str. 212-218. [COBISS.SI-ID 15261529]

DOBOVŠEK, Igor. A theoretical model of the interaction between plastic distortion and configurational stress on the phase transformation front. V: Proceedings of the 7th European Symposium on Martensitic Transformations, ESOMAT 2006, (Materials science & engineering. A, ISSN 0921-5093, Vol. 481-482). Amsterdam: Elsevier, 2008, str. 956-361. [COBISS.SI-ID 14629209]

DOBOVŠEK, Igor. Problem of a point defect, spatial regularization and intrinsic length scale in second gradient elasticity. V: ZENG, Kai (ur.). Mechanical Behaviour of Micro- and Nano-scale Systems, (Materials Science and Engineering, ISSN 0921-5093, Vol. 423, Issue 1-2). Amsterdam: Elsevier, 2006, str. 92-96. [COBISS.SI-ID 13962841]

DOBOVŠEK, Igor. Micromechanical modeling of nanostructured materials by polyclustering techniques. International journal of nanoscience, 2005, vol. 4, no. 4, str. 623-629. [COBISS.SI-ID 13904473]