

UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2017/18)						
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:		doc. dr. George Mejak				
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):		

<p>Kinematika kontinuuma. Deformacijski gradient. Mere deformacije, deformacijski tenzor. Homogena deformacija, razteg, strig. Deformacija ločnega, površinskega in volumskega elementa. Lagrangeev in Eulerjev opis gibanja. Materialni odvod. Transportni izreki.</p> <p>Ohranitveni zakoni. Zakon o ohranitvi mase. Princip o gibalni količini. Princip o vrtilni količini. Napetostni tenzor. Enačba gibanja. Termodinamika. Energija, entropija. Prvi in drugi zakon termodinamike.</p> <p>Konstitutivne zveze. Princip koordinatne indiferentnosti. Materialne simetrije, izotropija. Repräsentacija konstitucijskih funkcij.</p> <p>Osnovni modeli. Elastičnost, viskoelastičnost, plastičnost, fluidi.</p> <p>Robna naloga. Variacijski principi. Stabilnost ravnovesja. Univerzalne ravnovesne rešitve.</p>	<p>Kinematics of deformation. Deformation gradient. Deformation measures. Deformation tensor. Homogeneous deformation, dilatation, shear. Deformation of arc, surface and volume elements. Lagrangian and Euler description. Material time derivative. Transport theorems.</p> <p>Balance laws. Conservation of mass. Balance of linear momentum. Stress tensor. Balance of angular momentum. Cauchy momentum equation. Thermodynamics. Energy and the first law. Entropy and the second law.</p> <p>Constitutive relations. Material frame indifference. Material symmetry, isotropy. Representation of constitutive functions. Basic models, elasticity, viscoelasticity, plasticity, fluids</p> <p>Boundary value problem. Variational principles. Stability of the equilibrium. Universal equilibrium solutions.</p>
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Temeljni literatura in viri / Readings:

<p>Bertram A. Elasticity and Plasticity of Large Deformations, Springer, 2008. Chadwick P. Continuum Mechanics : Concise Theory and Problems, Dover, 1999. Gurtin M.E. An Introduction to Continuum Mechanics, Academic Press, 1981. Liu I.S. Continuum Mechanics, Springer, 2002. Tadmor E.B., Miller R.E. Elliot R.S. Continuum Mechanics and Thermodynamics, Cambridge, 2012.</p>
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Cilji in kompetence:

<p>Predstavitev osnovnih pojmov in vsebin mehanike kontinuuma s poudarkom na korektni matematični formulaciji in povezovanju predhodno osvojenih matematičnih znanj.</p>
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Objectives and competences:

<p>An overview of fundamental facts and ingredients of continuum mechanics with emphasis on correct mathematical formulation based on previously mastered mathematical knowledge.</p>

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:
Študentje nadgradijo svoje znanje uporabe matematike za reševanje problemov s področja naravoslovja in tehnike.

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:
To enhance knowledge and understanding of mathematical methods for solving problems from natural science and technology.

Metode poučevanja in učenja:

Predavanja, vaje, uporaba računalniške algebre, domače naloge, konzultacije.

Learning and teaching methods:

Lectures, exercises, usage of computer algebra, homework and consultations.

Načini ocenjevanja:

Tedenske domače naloge: 50%
Zagovor domačih nalog: 50%
Ocene: 1-5(negativno), 6- 10 (pozitivno)
(po Statutu UL)

Delež (v %) /
Weight (in %)

100%

Assessment:

Regular homework assignments: 50%.
Oral presentation of homework: 50%.
Grading: 1-5(fail), 6- 10 (pass) (Statute of UL)

Reference nosilca / Lecturer's references:

MEJAK, George. Variational formulation of the equivalent eigenstrain method with an application to a problem with radial eigenstrains. International journal of solids and structures, ISSN 0020-7683. [Print ed.], 2014, vol. 51, iss. 7-8, str. 1601-1616. [COBISS.SI-ID 17128281]
MEJAK, George. Esheby tensors for a finite spherical domain with an axisymmetric inclusion. European journal of mechanics. A, Solids, ISSN 0997-7538. [Print ed.], 2011, vol. 30, iss. 4, str. 477-490. [COBISS.SI-ID 16025177]
MEJAK, George. Finite element solution of a model free surface problem by the optimal shape design approach. International journal for numerical methods in engineering, ISSN 0029-5981.

[Print ed.], 1997, vol. 40, str. 1525-1550. [COBISS.SI-ID 9983833]