

UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2017/18)						
Predmet:		Mehanika deformabilnih teles				
Course title:		Mechanics of deformable bodies				
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:				M2119		
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 deformacije. Mere deformacije. Deformacijski tenzorji. Osnovni načini deformacije. Kompatibilnostni pogoji. Geometrična linearizacija. Teorija majhnih pomikov. Materialni odvod. Transportni izreki.</p> <p>Ohranitveni zakoni. Osnovni fizikalni principi. Napetostni tenzor. Termodinamika. Prostorski in materialni zapis vodiknih enačbe. Konstitutivne zveze. Princip koordinatne indiferentnosti.</p> <p>Elastičnost. Elastične simetrije, Izotropična elastičnost. Hiperelastičnost. Osnovni modeli hiperelastičnosti. Variacijski principi. Infinitesimalna elastičnost. Navierova enačba. Greenova funkcija. Ravninske naloge. Osnovne primeri prostorskih nalog. Elastično valovanje. Linearna mehanika loma.</p> <p>Neelastični modeli; termoelastičnost, viskoelastičnost, plastičnost.</p> <p>Osnove mehanike materialov. Princip ekvivalentne lastne deformacije. Efektivne materialne lastnosti. Homogenizacija.</p>	<p>Kinematics of deformation. Deformation measures. Deformation tensors. Basic types of deformation. Compatibility conditions. Geometric linearization. Small strain theory. Material derivative. Transport theorems</p> <p>Balance laws. Basic physical principles. Stress tensors. Thermodynamics. Material and space form of governing equations. Constitutive relations. Material frame indifference.</p> <p>Elasticity. Elastic symmetries. Isotropic elasticity. Hyperelasticity. Basic models of hyperelasticity. Variational principles. Infinitesimal elasticity. Navier equation. Green function. Plane problems. Basic examples of three dimensional problems. Elastic waves. Linear fracture mechanics.</p> <p>Inelasticity; thermoelasticity, viscoelasticity, plasticity.</p> <p>Introduction to mechanics of materials. Equivalent eigenstrain principle. Effective material properties. Homogenization.</p>
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Temeljni literatura in viri / Readings:

<p>Bertram A. Elasticity and Plasticity of Large Deformations, Springer, 2008.</p> <p>Bigoni D. Nonlinear Solid Mechanics: Bifurcation Theory and Material Instability, Cambridge, 2012.</p> <p>Holzappel G.A. Nonlinear Solid Mechanics: A Continuum approach for Engineering, Wiley, 2000.</p> <p>Gross D., Seelig T. Fracture Mechanics: With an Introduction to Micromechanics. Springer, 2011</p> <p>Slaughter W.S. The Linearized Theory of Elasticity. Birkhäuser, 2002.</p>

Cilji in kompetence:

<p>Predstavitev osnovnih pojmov in vsebin mehanike deformabilnih teles s poudarkom na korektni matematični formulaciji in povezovanju predhodno osvojenih matematičnih znanj.</p>

Objectives and competences:

<p>An overview of fundamental facts and ingredients of mechanics of deformable bodies with emphasis on correct mathematical formulation based on previously mastered mathematical knowledge.</p>
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Predvideni študijski rezultati:

Znanje in razumevanje:
Poznavanje in razumevanje osnovnih pojmov in principov mehanike deformabilnih teles.

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.

Intended learning outcomes:**Knowledge and understanding:**

To establish knowledge and understanding of fundamental principles of mechanics of deformable bodies.

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 %)

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]