

UČNI NAČRT PREDMETA / COURSE SYLLABUS						
<b>Predmet:</b>		Mehanika deformabilnih teles				
<b>Course title:</b>		Mechanics of deformable bodies				
<b>Študijski program in stopnja</b> Study programme and level		<b>Študijska smer</b> Study field		<b>Letnik</b> Academic year	<b>Semester</b> 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	
<b>Vrsta predmeta / Course type</b>				izbirni		
<b>Univerzitetna koda predmeta / University course code:</b>				M2119		
<b>Predavanja</b> Lectures	<b>Seminar</b> Seminar	<b>Vaje</b> Tutorial	<b>Klinične vaje</b> work	<b>Druge oblike</b> študija	<b>Samost. delo</b> Individ. work	<b>ECTS</b>
30	15	30			105	6
<b>Nosilec predmeta / Lecturer:</b>		doc. George Mejak				
<b>Jeziki /</b> <b>Languages:</b>	<b>Predavanja /</b> <b>Lectures:</b>	slovenski/Slovene, angleški/English				
	<b>Vaje / Tutorial:</b>	slovenski/Slovene, angleški/English				
<b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>				<b>Prerequisites:</b>		
<b>Vsebina:</b>				<b>Content (Syllabus outline):</b>		

<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 vodilnih 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:

Bertram A. Elasticity and Plasticity of Large Deformations, Springer, 2008.

Bigoni D. Nonlinear Solid Mechanics: Bifurcation Theory and Material Instability, Cambridge, 2012.

Holzappel G.A. Nonlinear Solid Mechanics: A Continuum approach for Engineering, Wiley, 2000.

Gross D., Seelig T. Fracture Mechanics: With an Introduction to Micromechanics. Springer, 2011

Slaughter W.S. The Linearized Theory of Elasticity. Birkhäuser, 2002.

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**Cilji in kompetence:**

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

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**Objectives and competences:**

An overview of fundamental facts and ingredients of mechanics of deformable bodies with emphasis on correct mathematical formulation based on previously mastered mathematical knowledge.

**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.

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**Metode poučevanja in učenja:**

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**Learning and teaching methods:**

Predavanja, vaje, uporaba računalniške algebre, domače naloge, konzultacije.	Lectures, exercises, usage of computer algebra, homework and consultations.
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Delež (v %) /

**Načini ocenjevanja:**

Weight (in %)

**Assessment:**

Tedenske domače naloge: 50% Zagovor domačih nalog: 50%		Regular homework assignments: 50%. Oral presentation of homework: 50%.
Ocene: 1-5(negativno), 6- 10 (pozitivno) (po Statutu UL)	100%	Grading: 1-5 (fail), 6- 10 (pass) (Statute of UL)

**Reference nosilca / Lecturer's references:**

<p>George Mejak:</p> <ul style="list-style-type: none"> <li>- 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]</li> <li>- MEJAK, George. Eshebly 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]</li> <li>- 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]</li> </ul>
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