UČNI NAČRT PREDMETA / COURSE SYLLABUS (leto / year 2016/17)	
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 Finančna matematika	ni smeri	1 ali 2	prvi ali drugi
Master's study programme Financial 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:	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):**

Kinematika. Deformacija, deformacijski tenzor. Green-Lagrangeev in Almansijev tenzor. Levi in desni Cauchy-Greenov deformacijski tenzor. Geometrijska linearizacija. Kompatibilnostni pogoji. Enačbe polja. Cauchyjev, prvi in drugi Piolla-Kirchhoffov napetostni tenzor. Enačbe gibanja v prostorskem in materialnem zapisu. Energijska enačba. Termodinamika, Clausius-Duhemova neenačba. Termodinamični potenciali, funkcija disipacije. Linearni modeli. Geometrijsko in materialno linearni modeli. Elastičnost. Posplošeni Hookov zakon. Princip materialne simetrije. Anizotropni material. Kristalografske simetrijske grupe. Problemi v R2. Ravninsko stanje napetosti, deformacij. Airyjeva napetostna funkcija. Flamantova rešitev za koncentrirano silo. Koncentracije napetosti. Problemi v R3. Naviereve enačbe. Rešitve s potenciali. Beltrami-Mitchellove enačbe. Singularne rešitve. Greenova funkcija za izotropni elastični prostor. Variacijski in komplementarni variacijski princip. Ritzova in Galerkinova metoda. Nelinearni modeli. Geometrijsko in materialno nelinearni modeli. Elastični potencial in funkcije deformacijske energije. Hiperelastičnost. Hipoelastičnost. Primeri uporabe v biomehaniki. Ireverzibilne deformacije. Plastičnost. Vezani problemi. Termoelastičnost. Splošni termodinamični principi. Reološka transformacija. Enačba stanja. Termoviskoplastičnost.		Kinematics of deformation. Deformation tensor. Green-Lagrange and Almansi tensor. Left and right Cauchy-Green deformation tensor. Geometric linearization. Conditions of compatibility. Field equations. Cauchy stress tensor, first and second Piolla-Kirchhoff stress tensor. Momentum balance in material and spatial formulation. Energy balance. Thermodynamics and Clausius-Duhem inequality. Thermodynamic potentials, dissipation function. Linear models. Geometrically and materially linear models. Elasticity. Generalized Hooke's law. Principle of material symmetry. Anisotropic material. Crystal symmetry groups. Problems in R2. Plane stress and plane strain. Airy stress function. Flamant's solution for concentrated force. Stress concentration. Problems in R3. Navier's equations. Solutions with potentials. Beltrami-Mitchell's equations. Singular solutions. Green's function for isotropic elastic space. Variational and complementary variational principle. Method of Ritz and Galerkin. Nonlinear models. Geometrically and materially nonlinear models. Elastic potential and deformation energy functions. Hyperelasticity. Hypoelasticity. Applications in biomechanics. Irreversible deformations. Plasticity. Coupled problems. Thermoelasticity. Generalized thermodynamical principles. Rheological transformation. Equations of state. Thermoviscoplasticity.

Temeljni literatura in viri / Readings:

R. W. Ogden: Non-Linear Elastic Deformations, Prentice Hall, Dover, 1997.

Y. C. Fung: Biomechanics, Mechanical Properties of Living Tissues, Springer, 1993.

P. Haupt: Continuum Mechanics and Theory of Materials, Springer, 2002.

R. W. Soutas-Little: Elasticity, Dover Publications, Dover, 1999.

R. J. Asaro, V. A. Lubarda: Mechanics of Solids and Materials, Cambridge University Press, New York, 2006.

Cilji in kompetence:	Objectives and competences:
Predstavitev osnovnih pojmov in vsebin mehanike deformabilnih teles s poudarkom na korektni matematični formulaciji in povezovanju predhodno osvojenih matematičnih znanj.	An overview of fundamental facts and ingredients of mechanics of deformable bodies 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 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: Celovit pogled na mehaniko deformabilnih teles v okviru mehanike kontinuuma. Reševanje problemov iz sorodnih področij mehanike materialov.	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: An overview of mechanics of deformable bodies within a general framework of continuum mechanics. Solving problems from related areas of mechanics of materials.

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

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