

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Mehanika 2
Course title:	Mechanics 2

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Tehnologije in sistemi – prva stopnja	/	drugi	tretji
Technologies and Systems – 1st cycle	/	second	third

Vrsta predmeta / Course type obvezni/obligatory

Univerzitetna koda predmeta / University course code: TS 2 UN 3

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Laboratorijske vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45		20	10		93	6

Nosilec predmeta / Lecturer: prof. dr. Andrej Lipej

Jeziki / Languages: slovenski/ slovenian	Predavanja / Lectures:	Slovenski/Slovenian
	Vaje / Tutorial:	Slovenski/Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:

- vpis v drugi letnik študija, lahko pa tudi predhodno opravljene vse študijske obveznosti pri predmetu Mehanika 1 in predmetu Matematična fizika in Repetitorij iz fizike.

Prerequisites:

- enrollment in the second year of study, but you can also complete all study obligations in the courses Mechanics 1 and the subject Mathematical Physics and Physics Repetition.

Vsebina:

- *Kinematične količine.* Opis gibanja v različnih koordinatnih sistemih. Galilejeva transformacija. Premočrtno, krožno in harmonično gibanje. Gibanje togega telesa. Splošno prostorsko gibanje. Sestavljeno gibanje točke in togega telesa. Coriolisov pospešek.
- *Dinamika masne točke.* Newtonovi zakoni. Gibalne enačbe. Gibalna in vrtilna količina.

Content (Syllabus outline):

- *Kinematic quantities.* Description of motion in different coordinate systems. Galilean transformation. Rectilinear, circular and harmonic movement. Motion of a rigid body. General spatial motion. Composite motion of a point and a rigid body. Coriolis acceleration.
- *Mass point dynamics.* Newton's laws. Equations of motion. Momentum and

Delo, energija in energijski zakoni. Dinamika sistema masnih točk in togega telesa. Inercialni in neinercialni sistemi. Sistemska sila. Dinamični vztrajnostni moment teles.

- *Mehanska nihanja*. Lastno, vsiljeno in dušeno nihanje, resonanca.
- *Osnove mehanike tekočin*. Tekočina kot zvezno telo. Hidrostatika. Vzgon.
- *Kinematika mehanike tekočin*. Eulerjev opis gibanja. Materialni odvod in transportni izrek. Tokovnice, tirnice in vrtničnice.
- *Dinamika neviskozne in viskozne tekočine*. Ohranitveni zakoni. Dinamika idealne in viskozne tekočine. Eulerjeva enačba gibanja neviskozne tekočine. Bernoullijeva enačba in njena uporaba. Adiabatno pretakanje tekočin. Pretakanje realnega fluida po cevovodih. Navier-Stokesove enačbe. Upor pri obtekanju teles.
- *Meritve v mehaniki tekočin*. Meritve pretoka. Meritve hitrosti in tlaka. Merilna oprema.

torque. Work, energy and energy laws. Dynamics of a system of mass points and a rigid body. Inertial and non-inertial systems. System force. Dynamic moment of inertia of bodies.

- *Mechanical fluctuations*. Free, forced and damped oscillation, resonance.
- *Fundamentals of fluid mechanics*. Fluid as a solid body. Hydrostatics. Buoyancy.
- *Kinematics of fluid mechanics*. Euler's description of motion. Material drain and transport theorem. Currents, rails and vortexes.
- *Dynamics of inviscid and viscous fluids*. Conservation laws. Dynamics of ideal and viscous fluids. Euler's equation of motion of an inviscid fluid. Bernoulli equation and its application. Adiabatic flow of fluids. Flow of a real fluid through pipelines. Navier-Stokes equations. Resistance to the flow of bodies.
- *Measurements in fluid mechanics*. Flow measurements. Velocity and pressure measurements. Measuring instruments.

Temeljni literatura in viri / Readings:

Temeljna literatura/Basic literature

Hibbeler, R. C. (2010) *Engineering mechanics. Dynamics*. Singapore: Upper Saddle River, NY: Pearson Prentice Hall: Pearson Education South Asia, cop.

Douglas, J. F., Gasiorek, J. M., Swaffield, J. A., Jack, L. B. (2011) *Fluid mechanics*. Harlow, England: New York: Pearson/Prentice Hall.

Strnad, J. (2016) *Fizika 1. del – Mehanika, toplota*. Ljubljana: DMFA.

Cilji in kompetence:

Učna enota prispeva predvsem k razvoju naslednjih splošnih in specifičnih kompetenc:

- sposobnost uporabe pridobljenega teoretičnega znanja v praksi,
- sposobnost evidentiranja problema in njegove analize ter predvidevanja operativnih rešitev v tehnološkem smislu ali v procesu organizacije in vodenja,
- sposobnost obvladovanja standardnih razvojnih metod, postopkov in procesov,

Objectives and competences:

The learning unit mainly contributes to the development of the following general and specific competences:

- the ability to use acquired theoretical knowledge in practice,
- the ability to identify a problem and analyze it, as well as foresee operational solutions in a technological sense or in the process of organization and management,
- the ability to master standard development methods, procedures and processes,

- sposobnost matematičnega razumevanja tehničnih problemov in uporaba matematike pri reševanju le-teh,
- sposobnost razumevanja in uporabe sodobnih teorij s področja tehniških, tehnoloških in naravoslovnih ved,
- sposobnost interdisciplinarnega povezovanja znanja,
- razvoj strokovnih veščin in spretnosti na področju tehnologij in sistemov,
- usposobljenost za svetovalno delo (prenos znanja).

- the ability to mathematically understand technical problems and use mathematics to solve them,
- the ability to understand and apply modern theories in the field of technical, technological and natural sciences,
- the ability to integrate knowledge in an interdisciplinary manner,
- development of professional skills and abilities in the field of technologies and systems,
- qualification for consulting work (transfer of knowledge).

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent/študentka:

- zna matematično analitično opisati dinamske lastnosti predmetov in tekočin,
- usvoji standardne metodološke prijeme za reševanje mehanskih problemov na področju dinamike trdnih teles in tekočin,
- uporablja matematično znanje za reševanje tehničnih problemov,
- razume umeščenost svojega strokovnega področja v matematično-naravoslovnih vedah,
- reflektira vsebine iz drugih strokovnih disciplin in jih poveže s pridobljenim znanjem.

Intended learning outcomes:

Knowledge and understanding:

Student:

- can describe the dynamic properties of objects and fluids mathematically and analytically,
- applies standard methodological approaches to solve mechanical problems in the field of dynamics of solid bodies and fluids,
- uses mathematical knowledge to solve technical problems,
- understands the location of his field of expertise in the mathematical and science disciplines,
- reflects contents from other disciplines and links them to the acquired knowledge.

Metode poučevanja in učenja:

- *predavanja* z aktivno udeležbo študentov (razlaga, diskusija, vprašanja, primeri, reševanje problemov).

Learning and teaching methods:

- *lectures* with active participation of students (explanation, discussion, questions, examples, problem solving).

Načini ocenjevanja:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

- ustni izpit
- pisni izpit

Ocenjevalna lestvica: ECTS.

Delež (v %) /

Weight (in %) /

Assessment:

Type (examination, oral, coursework, project):

- verbal exam
- written exam

Grading scale: ECTS.