

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Mehanika tekočin
Course title:	Fluid Mechanics

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

Vrsta predmeta / Course type izbirni/elective

Univerzitetna koda predmeta / University course code: TS IP UN 1

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Laboratorijske vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45		15	15		100	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/tretji letnik študija

Prerequisites:

- enrollment in the second/third year of study

Vsebina:

- **Osnove mehanike tekočin** – tekočina kot zvezno telo.
- **Fizikalno mehanske osnove:** Zakon o ohranitvi mase. Konstitutivna zveza med napetostjo in tenzorjem deformacijskih hitrosti. Hidrostatika.
- **Kinematika mehanike tekočin:** Eulerjev opis gibanja. Materialni odvod in transportni izrek. Tokovnice, tirnice in vrtinčnice.

Content (Syllabus outline):

- **Fundamentals of fluid mechanics** – fluid as a continuous body.
- **Physico-mechanical foundations:** Law of conservation of mass. Constitutive relationship between stress and strain rate tensor. Hydrostatics.
- **Kinematics of fluid mechanics:** Eulerian description of motion. Material drain and

- **Dinamika tekočin** – enačbe za kontrolni volumen, diferencialne enačbe gibanja tekočine.
- **Dinamika viskozne tekočine** – viskoznost, Navier Stokesove enačbe, turbulenca, mejna plast.
- **Notranji tokovi v vodnikih** – uvod, vodniki krožnega preseka.
- **Pregled numeričnih metod reševanja enačb mehanike tekočin** - Ohranitveni zapis enačb gibanja.
- **Meritve v mehaniki tekočin** - meritve hitrosti in tlaka, vizualizacija toka, merilna oprema in instrumenti, merilne postaje in vetrovniki.

- transport theorem. Currents, rails and vortices.
- **Fluid dynamics** – control volume equations, differential equations of fluid motion.
 - **Viscous fluid dynamics** – viscosity, Navier-Stokes equations, turbulence, boundary layer.
 - **Internal currents in conductors** – introduction, conductors with circular cross section.
 - **Overview of numerical methods for solving the equations of fluid mechanics** - Conservation notation of equations of motion.
 - **Measurements in fluid mechanics** - velocity and pressure measurements, flow visualization, measuring devices and instruments, measuring stations and wind tunnels.

Temeljni literatura in viri / Readings:

- L. Škerget: *Mehanika tekočin*, Fakulteta za strojništvo, Ljubljana, 1994.
- A. J. Chorin, J. E. Marsden: *A Mathematical Introduction to Fluid Mechanics*, 3rd edition, Springer, New York, 2000.
- J. H. Spurk: *Fluid Mechanics : Problems and Solutions*, Springer, Berlin, 1997.
- F. S. Sherman, *Viscous Flow*, McGraw-Hill Publishing Company, New York, 1990
- P. Bradshaw, *Experimental Fluid Mechanics*, Pergamon Press, Oxford, 1970

Cilji in kompetence:

- Učna enota prispeva k razvoju naslednjih splošnih in specifičnih kompetenc:*
- pridobitev temeljnega znanja o lastnostih kapljevin in plinov, razumevanje fizikalnih zakonov v tekočinah,
 - sposobnost evidentiranja in razumevanja zakonitosti mirujočih in gibajočih realnih tekočin,
 - sposobnost uporabe pridobljenega teoretičnega znanja v praksi,
 - sposobnost razumevanja in reševanja konkretnih tehnoloških problemov,

Objectives and competences:

- The learning unit contributes to the development of the following general and specific competencies:*
- acquisition of fundamental knowledge about the properties of liquids and gases, understanding of physical laws in liquids,
 - the ability to identify and understand the legality of stationary and moving real liquids,
 - the ability to use acquired theoretical knowledge in practice,
 - the ability to understand and solve concrete technological problems,

- suverenost in avtonomnost na področju strokovnega dela.

- sovereignty and autonomy in the field of professional work.

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent/študentka:

- razume pojme, pojave, procese in zakonitosti,
- zna poiskati in uporabljati ustrezno strokovno literaturo,
- zna uporabljati pridobljeno teoretično znanje v praksi,
- vidi medsebojne povezave v enostavnih in sestavljenih tehnoloških procesih,
- zna kritično ovrednotiti šibke točke v procesih,
- vidi povezave s sorodnimi učnimi predmeti.

Intended learning outcomes:

Knowledge and understanding:

Student:

- understands concepts, phenomena, processes and laws,
- knows how to find and use relevant professional literature,
- knows how to apply acquired theoretical knowledge in practice,
- recognises relationships in simple and complex technological processes,
- can critically evaluate weak points in processes,
- sees connections with related subjects.

Metode poučevanja in učenja:

- *predavanja,*
- *računske in laboratorijske vaje s praktičnimi primeri iz industrije.*

Learning and teaching methods:

- *lectures,*
- *computational and laboratory tutorials with practical examples from industry.*

Delež (v %) /

Weight (in %)

Načini ocenjevanja:**Assessment:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt):	Delež (v %) / Weight (in %)	Type (examination, oral, coursework, project):
<ul style="list-style-type: none"> • pisni del izpita (pozitivna ocena je pogoj za opravljanje ustnega dela izpita), • ustni del izpita. 	50 %	<ul style="list-style-type: none"> • the written part of the exam (a positive grade is a condition for passing the oral part of the exam),
Ocenjevalna lestvica: ECTS	50 %	<ul style="list-style-type: none"> • the oral part of the exam. Grading scale: ECTS