UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	CAE – Računalniško podprt inženiring
Course title:	CAE – Computer Aided Engineering

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

Vrsta predmeta / Course type	obvezni/obligatory

Univerzitetna koda predmeta / University course code:	TS 2 UN 6

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Laboratorijske vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45			30		135	7

Nosilec predmeta / Lecturer:	prof. dr. Andrej Lipej, Matej Štefanič, pred.

Jeziki / **Languages:**	**Predavanja /** **Lectures:**	Slovenski/Slovenian
	Vaje / Tutorial:	Slovenski/Slovenian

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

- poznavanje sistemov CAD.

Prerequisits:

- familiarity with CAD systems.

Vsebina:

- *Uvod v virtualni inženiring* (definicije, značilnosti) s poudarkom na MKE in CFD.
- *Arhitektura in komponente sistemov CAE.*
- *Osnove MKE in osnove procesa analize konstrukcijskih elementov.*
- *Analize in simulacije izdelkov za vrednotenje.*
- *Osnove CFD in proces analize.*
- *Integriran razvoj virtualnega izdelka.*

Content (Syllabus outline):

- *Introduction to virtual engineering (definitions, characteristics) with emphasis on FEM and CFD.*
- *Architecture and components of CAE systems.*
- *The basics of FEM and the basics of the analysis process of structural elements.*
- *Analysis and simulations of products for evaluation.*
- *Basics of CFD and the analysis process.*
- *Integrated virtual product development.*

Temeljni literatura in viri / Readings:

Temeljna literatura/Basic literature

Ren, Z., Ulbin, M., Vesenjak, M. (2018) Inženirske računalniške simulacije v konstrukterstvu. UN MB.

Madier, D. (2020) Practical Finite Element Analysis for Mechanical Engineers. FEA academy.

Hirsch, C. (2007) Numerical Computation of Internal and External Flows

Priporočljiva literatura/Recommended

Lee, H.H. (2023) Finite Element Simulations with ANSYS Workbench 2023

Muhič, S. (2009) *Računalniško podprt inženiring v okolju ANSYS Workbench*.

Kurowski, P.M. (2017) Finite Element Analysis for Design Engineers, 2nd Edition. SAE International.

Škerget, L. (1994) Mehanika tekočin

Munson, B.R., Okiishi, T.H., Heubsch, W.W., Rothmayer, A.P. (2012) Fundamentals of Fluid Mechanics, 7th Edition. Wiley.

Novejši članki v revijah ali na spletu

Cilji in kompetence:

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

- sposobnost evidentiranja problema in njegove analize ter predvidevanja operativnih rešitev v tehnološkem smislu,
- sposobnost obvladovanja standardnih razvojnih metod, postopkov in procesov
- sposobnost uporabe pridobljenega teoretičnega znanja v praksi,
- sposobnost obvladovanja razvoja in napredka,
- avtonomnost v strokovnem delu s področja tehnologij in sistemov,
- uporaba strokovnega tujega jezika v ustni in pisni obliki,
- kooperativnost, usposobljenost za timsko delo,
- sposobnost razumevanja in uporabe sodobnih teorij s področja tehniških, tehnoloških in naravoslovnih ved,
- sposobnost interdisciplinarnega povezovanja znanja,
- sposobnost reševanja konkretnih delovnih problemov na področju tehnologij in sistemov z uporabo standardnih strokovnih metod in postopkov,

Objectives and competences:

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

- the ability to identify a problem and analyze it, as well as anticipate operational solutions in a technological sense,
- the ability to master standard development methods, procedures and processes,
- the ability to use acquired theoretical knowledge in practice,
- the ability to manage development and progress,
- autonomy in professional work in the field of technologies and systems,
- use of a professional foreign language in oral and written form,
- cooperativeness, teamwork skills,
- the ability to understand and apply modern theories in the fields of technical, technological and natural sciences,
- the ability to integrate knowledge in an interdisciplinary manner,
- the ability to solve specific work problems in the field of technologies and systems using standard professional methods and procedures,

• razvoj strokovnih veščin in spretnosti na področju tehnologij in sistemov, • sposobnost stalne uporabe informacijske in komunikacijske tehnologije na svojem strokovnem področju • usposobljenost za svetovalno delo (prenos znanja), • aktivno kritično spremljanje razvoja novih metod uporabe materialov na področju tehnologij in sistemov s poudarkom na ekologiji.	• development of professional skills and abilities in the field of technologies and systems, • the ability to continuosly use information and communication technology in one's professional field, • qualification for consulting work (transfer of knowledge), • active critical monitoring of the development of new methods of using materials in the field of technologies and systems with an emphasis on ecology and sustainable development.

Predvideni študijski rezultati:

Intended learning outcomes:

Znanje in razumevanje: *Študent/študentka:* • pozna in razume aktivnosti pri razvoju izdelkov in podporo računalnika v vseh fazah razvoja izdelka, • pozna in razume vlogo in zmožnosti CAE (virtualnega inženirstva) v razvoju izdelka, s poudarkom na strukturnih analizah in analizah numerične dinamike tekočin, • pozna standardna programska orodja in standardne formate za prenos iz orodij za modeliranje v sisteme CAE, • kakovostno ovrednoti pridobljene rezultate**.**	Knowledge and understanding: *Student:* • knows and understands product development activities and computer support in all phases of product development, • knows and understands the role and capabilities of CAE (virtual engineering) in product development, with emphasis on structural analysis and computational fluid dynamics, • knows standard software tools and standard formats for the transfer of modelling tools into CAE systems, • qualitatively evaluates the results obtained.

Metode poučevanja in učenja:

Learning and teaching methods:

• frontalna multimedijska predavanja, • reševanje domačih nalog, • projektna naloga.	• face-to-face multimedia lectures, • solving homework, • Project work.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Način (pisni izpit, ustno izpraševanje, naloge, projekt):		Type (examination, oral, coursework, project):
• opravljena seminarska naloga	50% ocene	• Completed seminar assignment
• zagovor seminarske naloge	20% ocene	• defense of the seminar thesis
• pisni (ustni) izpit	30% ocene	• written (oral) exam

Ocenjevalna lestvica: ECTS.		Grading scale: ECTS.