

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Prenos toplote v stavbah
Course title:	Heat and mass transfer in buildings

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Tehnologije in sistemi – prva stopnja	Tehnologije in sistemi	tretji	peti
Technologies and systems – 1st cycle	Technologies and systems	third	fifth

Vrsta predmeta / Course type Modularni/modular

Univerzitetna koda predmeta / University course code: TS M3 UN2

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. Ivan Bajsić

Jeziki / Languages:	Predavanja / Lectures:	slovenski, angleški/ slovenian, english
	Vaje / Tutorial:	slovenski, angleški/ slovenian, english

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

- vpis v tretji letnik študija,
- znanje vsaj enega tujega jezika (angleščina, nemščina),
- študent/študentka pripravi seminarsko nalogo, ki jo predstavi pred občinstvom (študenti, profesorji).

Prerequisites:

- enrollment in the third year of study,
- knowledge of at least one foreign language (English, German),
- the student prepares a seminar paper to be presented in front of the audience (students, professors).

Vsebina:

- *Osnove gradbene fizike.* Meteorološke projektne osnove. Notranji bivalni pogoji in toplotno ugodje. Vlažen zrak. Škodljive snovi in vonjave. Prehod toplote skozi gradbene konstrukcije. Prehod vlage skozi gradbene konstrukcije. Toplotna izolacija stavb in naprav. Osnove akustike.
- *Zimske izgube toplote.* Izračun izgub toplote. Infiltracija zraka.
- *Letni dobitki toplote.* Izračun toplotnih obremenitev. Celoletne bilance toplotnih obremenitev.
- *Metode simulacij.*

Content (Syllabus outline):

- *Fundamentals of building physics.* Meteorological project basics. Indoor living conditions and thermal comfort. Humid air. Harmful substances and odors. Heat transfer through buildings. The passage of moisture through buildings. Thermal insulation of buildings and devices. Basics of acoustics.
- *Winter heat losses.* Calculation of heat losses. Air infiltration.
- *Annual heat gains.* Calculation of heat loads. Year-round heat load balances.
- *Simulation methods.*

Temeljni literatura in viri / Readings:

Muhič, S. (2017) *Prenos toplote in snovi v stavbah. 1. izd.* Novo mesto: Fakulteta za tehnologije in sisteme.

ASHRAE *Handbook Fundamentals* (2013) Atlanta: Ashrae.

Recknagel, Sprenger, Schramek (2013/2014) *Taschenbuch für Heizung + Klima Technik.* München, Wien: Oldenburg Verlag.

Recknagel, Sprenger, Schramek, Čeperković (2012) *Grejanje i klimatizacija.* Vrnjačka Banja: Interklima.

Todorović, B. (1998) *Klimatizacija.* Beograd: SMEITS.

Standardi CEN in ISO.

Cilji in kompetence:

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

- pridobitev temeljnega znanja o energijah, razumevanja pretvarjanja ene vrste energije v drugo, predvsem pretvarjanja v toploto in mehansko oz. električno delo,
- sposobnost evidentiranja in razumevanja termodinamičnih zakonitosti,
- sposobnost uporabe pridobljenega teoretičnega znanja v praksi,
- sposobnost reševanja konkretnih termodinamičnih problemov,
- sposobnost obvladovanja razvoja,
- suverenost in avtonomnost na področju strokovnega dela,
- sposobnost za svetovalno delo in sposobnost prenosa znanja drugim.

Objectives and competences:

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

- acquisition of basic knowledge about energies, understanding of the conversion of one type of energy into another, especially conversion into heat and mechanical or electrical work,
- the ability to record and understand thermodynamic laws,
- the ability to use acquired theoretical knowledge in practice,
- the ability to solve specific work problems in the field of thermodynamics,
- the ability to manage development and progress,
- autonomy in professional work,

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Predvideni študijski rezultati:

Znanje in razumevanje:

Študent/študentka:

- seznanjeni se z osnovnimi pogoji za dobro bivalno okolje,
- spozna in doume pomen prehoda toplote in snovi v stavbah za kakovost bivanja,
- doume vpliv toplotne zaščite stavb na rabo energije in kakovost bivanja,
- pridobi znanje o metodah izračunov toplotnih bilanc v stavbah,
- spozna pravno regulativo (standarde), ki ureja to področje in je osnova za projektno delo,
- spozna osnove prenosa snovi skozi gradbene konstrukcije,
- spozna drugo tehnično disciplino – arhitekturo in gradbeništvo z osnovnimi materiali,
- pridobi osnovno znanje za uporabo različnih simulacijskih metod.

- qualification for consulting work and transfer of knowledge.

Intended learning outcomes:

Knowledge and understanding:

Student:

- learns the basic conditions for a good living environment,
- learns and understands the importance of heat and mass transfer in buildings for the quality of living,
- understands the impact of thermal insulation of buildings on energy consumption and quality of life,
- acquire knowledge of the methods for calculating thermal balances in buildings,
- learns about the legal regulations (standards) that govern this area and are the basis for project work,
- gets acquainted with the basics of mass transfer through buildings,
- gets acquainted with another technical discipline – architecture and construction with basic materials,
- acquires basic knowledge for the application of various simulation methods.

Metode poučevanja in učenja:

- *predavanja* z aktivno udeležbo študentov (razlaga, diskusija o problemih, razvijanje ustvarjalnosti),
- *vodeni individualni študij* za uporabo simulacijskih metod,
- *seminarske naloge* za utrjevanje znanja in njegovo praktično uporabo,
- *seznanjanje z merilnimi instrumenti*, uporabnimi za kontrolo prenosa in snovi,
- *uporaba spletnih virov* in seznanjanje s strokovno literaturo ter praktična uporaba dosegljive dokumentacije (knjig, revij, arhivov itd.),
- *strokovne ekskurzije* in ogledi izbranih pomembnih gradbenih objektov.

Learning and teaching methods:

- *lectures* with active participation of students (explanation, discussion of problems, development of creativity),
- *guided individual study* for the use of simulation methods,
- *seminar assignments* for consolidating knowledge and its practical application,
- *familiarization with measuring instruments* useful for control of transfer and substances,
- *use of online resources* and familiarization with professional literature and practical use of available documentation (books, magazines, archives, etc.),
- *professional excursions* and tours of selected important construction facilities.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Način (pisni izpit, ustno izpraševanje, naloge, projekt): <ul style="list-style-type: none"> • pisni (ustni) izpit, • projektno seminarsko delo. Ocenjevalna lestvica: ECTS.	50% ocene 50% ocene	Type (examination, oral, coursework, project): <ul style="list-style-type: none"> • written (verbal) exam, • project seminar work. Grading scale: ECTS.