



## Učni načrti

Visokošolski strokovni študijski  
program prve stopnje

**OPERATIVNO GRADBENIŠTVO (VS)**

## Course Syllabi

1<sup>st</sup> Cycle Higher Education Professional Study

**CONSTRUCTION MANAGEMENT (BA)**

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3. LETNIK / 3<sup>RD</sup> YEAR

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3. LETNIK / 3<sup>RD</sup> YEAR

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## Učni načrt predmeta/Course syllabus

**Predmet:****FIZIKA****Course title:****PHYSICS****Študijski programi in stopnja****Študijska smer****Letnik****Semestri**

Operativno gradbeništvo, prva stopnja, visokošolski strokovni

Ni členitve (študijski program)

1. letnik

Zimski

**Univerzitetna koda predmeta/University course code:**

964

**Predavanja****Seminar****Vaje****Klinične vaje****Druge oblike študija****Samostojno delo****ECTS**

45

15

30

0

0

90

6

**Nosilec predmeta/Lecturer:**

Jure Kokalj

**Vrsta predmeta/Course type:**

Obvezni splošni/Obligatory general

**Jeziki/Languages:**

Predavanja/Lectures:

Slovenščina

Vaje/Tutorial:

Slovenščina

**Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:****Prerequisites:****Vsebina:****Content (Syllabus outline):**

Fizikalne količine in merske enote; opis gibanja. Premo gibanje. Krivo gibanje v ravnini: vektorska obravnava gibanja, tangentni in radialni pospešek, kroženje; sila; opis sile z vektorjem. 1. in 3. Newtonov zakon. Sila podlage, teža, sila upora, sila vzmeti; navor sile; težišče; 2. Newtonov zakon. Izrek o gibanju težišča; sile pri kroženju, vztrajnostni moment, Steinerjev izrek; delo sile, moč sile; kinetična, potencialna in prožnostna energija; ohranitev mehanske energije; Newtonov gravitacijski zakon; zgradba snovi.

Physics and measurements; kinematics: motion in one dimension, motion in two dimensions, vectors, tangential and radial acceleration, circular motion; force, description of force with vectors, 1st and 3rd Newton's law, weight, forces of friction, spring force; torque, centre of gravity; Newton's 2nd law, motion of a system of particles; Forces and circular motion, moment of inertia, Steiner theorem; work and power done by a force; kinetic, potential and elastic energy; energy conservation; Newton's law of gravitation; Structure of matter.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Osnovne lastnosti trdne snovi, kapljev in plinov; Hookov zakon; stisljivost; Boylov zakon; težni tlak, manometri. Merjenje tlaka z zaprtim in odprtim živosrebrnim manometrom; vzgon; temperatura; temperaturna razteznost; plinska enačba, zmesi plinov; notranja energija, toplota, zakon o ohranitvi energije. Toplotni izvori. Specifična toplota, toplotna kapaciteta, sežigna toplota; prenos toplote; prevajanje toplote; toplotni upor, prevajanje skozi več plasti; prestopni koeficienti, K-faktor; spremembe agregatnega stanja. Izhlapljanje in vlažnost; higrometri. | Basic properties of solid state, liquid and gases, Hook's law, Volume elasticity Boyle's law, hydrostatic pressure, manometers, closed and open Hg manometer, buoyant force temperature, temperature expansion equation of ideal gas, gas mixtures, internal energy, heat, energy conservation; heat sources, specific heat, heat capacity, heat of combustion; heat transfer, thermal conduction; heat resistively, heat transfer through multi layers; heat transfer coefficient, K-factor (U-factor); phase changes, evaporation and humidity, hygrometers. |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Temeljna literatura in viri/Readings:**

Kladnik, R. 1989. Visokošolska fizika, Mehanski in toplotni pojavi. Ljubljana, DZS, 228 str.

Kladnik, R. 1989. Visokošolska fizika, Valovni pojavi. Ljubljana, DZS, str. 80-86.

Kladnik, R. in Šolinc, H. 1990. Zbirka fizikalnih nalog z rešitvami 1. 2. natis. Ljubljana: Državna založba Slovenije, 1990. 237 str., ilustr.

**Cilji in kompetence:****Cilji:**

- seznaniti študenta z osnovnimi zakonitostmi in pomenom fizikalnih metod pri opisu naravnih pojavov.

**Predmetnospecifične kompetence:**

- razume in uporablja fizikalni način razmišljanja pri formulaciji in reševanju tehničnih problemov,

- obvladuje praktične in teoretične osnove fizike, potrebne za študij in razumevanje stroke.

**Objectives and competences:****Objectives:**

- students will learn the basic physical laws and will become acquainted with the methods used for description of natural laws.

**Competences:**

- understand and use physical way of thinking for formulating and solving technical problems,

- will be able to use practical and theoretical knowledge of physics that is needed for study and understanding of his/her profession.

**Predvideni študijski rezultati:****Študent**

- bo sposoben prepoznati in razložiti zakonitosti iz poglavij fizike, ki so naštet v "Vsebini",

- pridobljena znanja bo uporabil pri nekaterih strokovnih predmetih,

- bo sposoben poenostaviti kompleksne fizikalne probleme in pridobiti približno rešitev,

- bo sposoben kritično presojeti rezultate na področju inženirstva, uporabljati učbenike in priročnike,

**Intended learning outcomes:****Student**

- will be able to recognize and explain the topics listed in the content section,

- will be able to apply the methods of physics in order to solve engineering problems,

- will be able to simplify complex problem and obtain an approximate solution,

- will be able to evaluate critically results in the field of engineering and to use textbooks and handbooks,

- bo sposoben razložiti različne prikaze odvisnosti dveh ali več količin (grafi, tabele, funkcije).

- will be able to explain different graphs and other demonstrations of functional dependencies.

#### Metode poučevanja in učenja:

#### Learning and teaching methods:

Predavanja in seminar z nekaj demonstracijskimi poskusi in računalniškimi simulacijami:

- Računski zgledi na seminarskih vajah.
- Individualne naloge ali seminarji.

Lectures and seminars together with a few laboratory demonstrations and computer simulations:

- Problem solving classes.
- Individual assignments or essays.

#### Načini ocenjevanja:

#### Delež/Weight Assessment:

|                                         |         |                                          |
|-----------------------------------------|---------|------------------------------------------|
| Računski del (pisno)                    | 50,00 % | Practical part (written)                 |
| Projekt (seminarska naloga)             | 10,00 % | Written seminar report                   |
| Teoretični del (pisno in ustni zagovor) | 40,00 % | Theoretical part (written and oral part) |

#### Reference nosilca/Lecturer's references:

J. Kokalj, Bad-metallic behavior of doped Mott insulators, Phys. Rev. B 95, 041110(R) (2017).

J. Kokalj, Ross H. McKenzie, Thermodynamics of a Bad Metal-Mott Insulator Transition in the Presence of Frustration, Phys. Rev. Lett. 110, 206402 (2013).

T. Shirakawa, T. Tohyama, J. Kokalj, S. Sota, and S. Yunoki, Ground-state phase diagram of the triangular lattice Hubbard model by the density-matrix renormalization group method, Phys. Rev. B 96, 205130 (2017).

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                  |
|----------------------|----------------------------------|
| <b>Predmet:</b>      |                                  |
|                      | <b>INŽENIRSKA KOMUNIKACIJA</b>   |
| <b>Course title:</b> |                                  |
|                      | <b>ENGINEERING COMMUNICATION</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 1. letnik | Zimski   |

|                                                            |     |
|------------------------------------------------------------|-----|
| <b>Univerzitetna koda predmeta/University course code:</b> | 973 |
|------------------------------------------------------------|-----|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 0    | 15            | 0                    | 45              | 3    |

|                                   |               |
|-----------------------------------|---------------|
| <b>Nosilec predmeta/Lecturer:</b> | Tomo Cerovšek |
|-----------------------------------|---------------|

|                                    |                                            |
|------------------------------------|--------------------------------------------|
| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni /Obligatory professional |
|------------------------------------|--------------------------------------------|

|                          |                      |             |
|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

|                                                                              |                       |
|------------------------------------------------------------------------------|-----------------------|
| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b> |
|                                                                              |                       |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p>Uvod v teorijo komunikacij; definicija inženirske komunikacije, oblike komunikacije, semiotika v inženirstvu in arhitekturi; nadmerje in entropija, kodirni sistemi, znakovni sistemi Shannon-Weaver in Piercov model; inženirski model komunikacij in standardizacija.</p> <p>Predmet in kontekst inženirske komunikacije; organizacija, proces in rezultati gradbenega projekta; procesni model graditve kot kontekst komunikacije; vloga inženirske komunikacije pri projektne delu.</p> | <p>Introduction to communication theory; definition of Engineering Communication, types of communication, semiotics in engineering and architecture; entropy, coding systems, sign systems, Shannon-Weaver and Pierce model of communication; model of Engineering communication and standardization.</p> <p>Subject and context of engineering communication; organization, processes, and results of a project; a project process model as context for</p> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| <p>Kodiranje v inženirstvu; simboli, znaki in indeksi v inženirstvu, uporaba inženirskih znakov v sistemu tehnične risbe; uporabna geometrija za konstruiranje elementov vizualne komunikacije (elementi in transformacije); projekcije (metrika, preslikave, uporaba); preslikave med 2D in 3D (točka, premica, ravnina, predori, preseki, metrične naloge).</p> <p>Računalniško podprto načrtovanje; avtorska okolja za inženirske risbe in modele; podajanje, zapis in računalniška predstavitev geometrije; informacijsko modeliranje stavb in njegova uporaba.</p> <p>Izvedba projektov z BIM za upravljanje opravil in nadzor kakovosti; BIM in digitalni dvojčki kot komunikacijski medij; napredna inženirska komunikacija med operativno izvedbo projektov in obratovanjem stavbe; demonstracija uporabe opisnih digitalnih dvojčkov za ponazoritev funkcionalnih elementov stavbnih sistemov, dejanske uporabe ter delovanja stavbe ter stanja stavbe s poudarkom na trajnostnih vidikih ter ugodjem bivanja.</p> <p>Računalniška izmenjava podatkov; standardi za zapis in izmenjavo inženirskih informacij ; okolja za izmenjavo inženirskih informacij; interoperabilnost in okolja za izmenjavo.</p> | <p>communication; the role of communication in building project work.</p> <p>Encoding in Engineering; symbols, signs, and indexes in engineering; the use of engineering signs in technical drawings, descriptive geometry for practical construction and visual communication (elements and transformations); projections (metrics, mapping, applications), mappings between 2D and 3D (points, lines, planes, intersections, metrical problems).</p> <p>Computer Aided Design; authoring environments for technical drawings and models; input, presentation, representations of geometry; building information modelling.</p> <p>BIM construction management for task management and quality control; BIM and digital twins as communication medium; advanced engineering communication during construction and operation; the demonstration of the use of descriptive digital twins for visualisation of the functional elements of building systems, actual use of the buildings, and for the overview of the building status with emphasis on sustainability aspects and end-users wellbeing.</p> <p>Computer exchange of engineering data; standards for representation and exchange of engineering information; environments for the exchange of engineering data; interoperability and collaboration</p> |
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**Temeljna literatura in viri/Readings:**

Cerovšek, T. 2013. Zbirka nalog iz uporabne geometrije in dvočrtnega postopka, študijsko gradivo, Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo, 2014, str. 40.

Bielefeld B. in I. Skiba, I. 2007. Technical drawing, Basel ; Boston ; Berlin : Birkhäuser, 2007. 74 str.

Krebs, J. 2007. CAD (Basics). Boston ; Berlin : Birkhäuser, cop. 2007. 94 str.

Prebil, I. 2002. Opisna geometrija : potrebna znanja za pravilno risanje - osnove tehničnega risanja. 3. predelana izd., Ljubljana, Fakulteta za strojništvo, 148 str.

Cerovšek, T. 2013. Gradiva v računalniški učilnici: Uvod v teorijo komunikacij, Kodiranje v inženirstvu, Računalniška grafika in transformacije, <http://ucilnica.fgg.uni-lj.si>

**Cilji in kompetence:****Objectives and competences:**

|                                                                                                                                                                |                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <p>Cilji:</p> <ul style="list-style-type: none"> <li>- študenta seznaniti z inženirsko komunikacijo,</li> <li>- seznaniti z inženirsko pismenostjo,</li> </ul> | <p>Objectives:</p> <ul style="list-style-type: none"> <li>- understand the impact of engineering communication,</li> </ul> |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| <ul style="list-style-type: none"> <li>- naučiti uporabo orodij za podajanje geometrije,</li> <li>- izkusiti projektno komunikacijo na osnovi BIM,</li> <li>- demonstrirati delovanje stavbe z digitalnimi dvojčki.</li> </ul> <p>Predmetnospecifične kompetence:</p> <ul style="list-style-type: none"> <li>- uporaba inženirskega znakovnega sistema,</li> <li>- zahtevati in posredovati inženirske podatke,</li> <li>- interpretacija inženirskih načrtov in izdelkov,</li> <li>- grafično komunicirati o inženirskih problemih,</li> <li>- samostojno izdelati enostavno projektno dokumentacijo,</li> <li>- uporabljati BIM med izvedbo projektov,</li> <li>- uporabljati digitalne dvojčke med obratovanjem.</li> </ul> | <ul style="list-style-type: none"> <li>- obtain engineering literacy with the necessary skills,</li> <li>- use the key tools for engineering communication,</li> <li>- enhance project communication with BIM models,</li> <li>- demonstrate building operation with digital twins.</li> </ul> <p>Competences:</p> <ul style="list-style-type: none"> <li>- use engineering coding systems,</li> <li>- demand and transmit engineering data,</li> <li>- interpret engineering drawings and artefacts,</li> <li>- graphically communicate engineering problems,</li> <li>- independently develop simple project docs,</li> <li>- use of BIM during the construction project phase,</li> <li>- use digital twins during the operation of buildings.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| <p>Poznavanje in razumevanje inženirske komunikacije in projektne komunikacije pri gradbenih projektih.</p> <p>Poznavanje, razumevanje in uporaba inženirskega znakovnega sistema (1500 znakov) in standardov.</p> <p>Poznavanje in razumevanje projekcij in njihove uporabe v inženirstvu.</p> <p>Sposobnost samostojne izdelave elementov inženirske risbe in vizualne komunikacije.</p> <p>Samostojna uporaba orodij za računalniško podprto načrtovanje.</p> <p>Sposobnost uporabe BIM in digitalnih dvojčkov za projektno komunikacijo in razumevanje konceptov trajnostnega pristopa z uporabo modelov.</p> | <p>Knowledge and understanding of engineering and project communication in building projects.</p> <p>Knowledge, understating, and use of engineering sign systems (1500 new symbols) and new standards.</p> <p>Knowledge and understating of projections and their use in computer communication.</p> <p>The ability to independently authoring of engineering drawings and visual communication.</p> <p>Knowledge of to use of computer tools for computer-aided design.</p> <p>Ability to use BIM and digital twins for project communication and understanding of sustainability concepts through the use of models.</p> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                                                                    |                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Predavanja dostopna tudi preko spleta, delo v skupini, samostojna preverba ključnih vsebin.</p> | <p>Learning is supported by online learning content management systems with interactive content, student work is individual as well as in groups.</p> |
|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                     |         |                      |
|---------------------|---------|----------------------|
| Seminarske naloge   | 20,00 % | Seminar work         |
| Kolokviji ali izpit | 70,00 % | Midterm exam or exam |

|         |         |         |
|---------|---------|---------|
| Projekt | 10,00 % | Project |
|---------|---------|---------|

**Reference nosilca/Lecturer's references:**

CEROVŠEK, Tomo. Informacijsko modeliranje zgradb (BIM) : standardi. Gradb. vestn., avg. 2010, letn. 59, št. 8, str. 206-208.

CEROVŠEK, Tomo. Pristop BIM - ključ digitalizacije gradbenih projektov : [projektiranje - BIM ni več prihodnost ampak sedanjost]. Pro Bauhaus. poletje 2019, [št.] 1, str. 94-100, ilustr. ISSN 2670-4870.

CEROVŠEK, Tomo, KATRANUSCHKOV, Peter. Active process model supported collaboration. V: SCHERER, Raimar J. (ur.), KATRANUSCHKOV, Peter (ur.), SCHAPKE, Sven-Eric (ur.). CIB W78 22nd conference on information technology in construction, July 19-21, 2005, Dresden, Germany, (CIB Publication, No. 304). Dresden: Institute for Construction Informatics, Technische Universität, 2005, str. 97-104.

STEGNAR, Gašper, CEROVŠEK, Tomo. Information needs for progressive BIM methodology supporting the holistic energy renovation of office buildings. Energy. 2019, vol. 173, str. 317-331. ISSN 0360-5442. DOI: /10.1016/j.energy.2019.02.087.

CROMWIIK, Jan, POORT, Carmen, CEROVŠEK, Tomo, MORO, Andrea, BREEN, Martin. From insight into energy transition maturity to powerful task-based cross-sectoral upskilling. V: Clima 2022 : REHVA 14th HVAC World Congress, 22nd-25th May, Rotterdam, Netherlands : eye on 2030 : towards digitalized, healthy, circular and energy efficient HVAC : proceedings. [Delft]: TU Delft Open, 2022. Str. 1-8, ilustr. <https://proceedings.open.tudelft.nl/clima2022/article/view/180>, DOI: doi.org/10.34641/clima.2022.180.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                  |
|----------------------|----------------------------------|
| <b>Predmet:</b>      |                                  |
|                      | <b>INŽENIRSKA MATEMATIKA I</b>   |
| <b>Course title:</b> |                                  |
|                      | <b>ENGINEERING MATHEMATICS I</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 1. letnik | Zimski   |

|                                                            |     |
|------------------------------------------------------------|-----|
| <b>Univerzitetna koda predmeta/University course code:</b> | 965 |
|------------------------------------------------------------|-----|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 45         | 0       | 45   | 0             | 0                    | 90              | 6    |

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|-----------------------------------|---------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Nik Stopar, Gašper Jaklič |
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| <b>Vrsta predmeta/Course type:</b> | Obvezni splošni/Obligatory general |
|------------------------------------|------------------------------------|

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|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

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| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b> |
|                                                                              |                       |

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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                           | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                      |
| Množice, števila, preslikave; linearna algebra: geometrijski vektorji, sistemi linearnih enačb, matrike, determinante, lastne vrednosti in lastni vektorji matrik; številski zaporedja in vrste; limita in zveznost funkcije ene spremenljivke, lastnosti zveznih funkcij, odvod funkcije ene spremenljivke, lastnosti odvedljivih funkcij, lokalni in globalni ekstremi. | Sets, numbers, mappings; linear algebra: geometric vectors, systems of linear equations, matrices, determinants, eigenvectors and eigenvalues of matrices; numerical sequences and series; limits and continuity of functions of one real variable, properties of continuous functions; derivative of functions of one real variable, properties of differentiable functions, local and global extrema. |

**Temeljna literatura in viri/Readings:**

Izbrana poglavja iz:

Vidav, I. 1981. Višja matematika I, DZS, DMFA založništvo, Ljubljana, 1981, str. 9-340.

Mendelson, E. 1999. Frank Ayres, Schaum's Outline of Calculus, McGraw-Hill, str. 1-115.

Mizori-Oblak, P. 2001. Matematika za študente tehnike in naravoslovja I (zbirka nalog). Ljubljana, Fakulteta za strojništvo, 380 str.

**Cilji in kompetence:**

Cilji:

- pridobiti osnovna znanja s področja matematike, na katerih lahko študent gradi znanja pri strokovnih predmetih,
- obvladovanje osnovnih računskih veščin in krepitev smisla za sistematičnost, jasnost in preciznost formulacij.

Predmetnospecifične kompetence:

- razumevanje osnovnega matematičnega orodja, ki ga uporabljajo strokovni predmeti,
- sposobnost uporabe osnovnih računskih veščin v strokovni praksi,
- razvijanje matematičnega mišljenja na enostavnejših primerih.

**Objectives and competences:**

Objectives:

- basic knowledge in mathematics needed for the engineering courses,
- managing basic computational skills,
- to train for systematic, clear and precise formulations.

Competences:

- knowledge and understanding of basic mathematical tools used by professional courses,
- capability of using basic computational skills in engineering,
- mathematical way of reasoning for basic problems.

**Predvideni študijski rezultati:**

- osvojeno osnovno znanje in razumevanje linearne algebre in matematične analize
- obvladanje osnovnih računskih veščin
- uporaba matematičnih orodij pri formulaciji in reševanju problemov
- uporaba matematičnega znanja pri strokovnih predmetih
- sposobnost sistematične, jasne in natančne formulacije problemov
- zmožnost kritične presoje podatkov in dobljenih računskih rezultatov
- spretnost pri uporabi literature

**Intended learning outcomes:**

- basic knowledge and understanding of linear algebra and mathematical analysis
- mastering of basic computational skills
- ability to use mathematical tools in formulation and solving of problems
- using mathematical knowledge in engineering courses
- capability of systematic, clear and precise formulation of problems
- ability of critical judgement of data and obtained numerical results
- skills in using literature

**Metode poučevanja in učenja:**

Predavanja, seminarske vaje, domače naloge, konzultacije.

**Learning and teaching methods:**

Lectures, tutorials, homework, consultations.

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                        |         |                         |
|------------------------|---------|-------------------------|
| Naloge in sprotno delo | 70,00 % | Exercises and homework  |
| Izpit (teoretičen del) | 30,00 % | Exam (theoretical part) |

**Reference nosilca/Lecturer's references:**

JAKLIČ, Gašper, KOZAK, J., KRAJNC, M., VITRIH, V., ŽAGAR, E. High-order parametric polynomial approximation of conic sections, *Constructive Approximation*, Volume 38, Issue 1 (2013), 1-18.

JAKLIČ, Gašper, KOZAK, J., KRAJNC, M., VITRIH, V., ŽAGAR, E. Hermite geometric interpolation by rational Bezier spatial curves, *SIAM Journal on Numerical Analysis*, Vol. 50, No. 5, 2012, pp. 2695-2715.

JAKLIČ, Gašper, ŽAGAR, E. Planar cubic G1 interpolatory splines with small strain energy, *Journal of Computational and Applied Mathematics*, 235 (2011), 2758-2765.

OMLADIČ, Matjaž, STOPAR, Nik, Multivariate imprecise Sklar type theorems. *Fuzzy sets and systems : international journal of soft computing and intelligence*, 428 (2022), 80-101.

ĐURIĆ, Alen, JEVĐENIĆ, Sara, STOPAR, Nik. Compressed zero-divisor graphs of matrix rings over finite fields, *Linear and Multilinear Algebra*, 69 (2021), 2012-2039.

OMLADIČ, Matjaž, STOPAR, Nik, Final solution to the problem of relating a true copula to an imprecise copula. *Fuzzy sets and systems : international journal of soft computing and intelligence*, 393 (2020), 96-112.

STOPAR, Nik, Rank of elements of general rings in connection with unit-regularity, *Journal of Pure and Applied Algebra*, 224 (2020), 106211 (11 str.).

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                                         |
|----------------------|---------------------------------------------------------|
| <b>Predmet:</b>      |                                                         |
|                      | <b>KOMUNALNO GOSPODARSTVO IN GRADBENA ZAKONODAJA</b>    |
| <b>Course title:</b> |                                                         |
|                      | <b>MUNICIPAL ECONOMICS AND CONSTRUCTION LEGISLATION</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 1. letnik | Zimski   |

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|------------------------------------------------------------|-----|
| <b>Univerzitetna koda predmeta/University course code:</b> | 966 |
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| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 30   | 0             | 0                    | 60              | 4    |

|                                   |                                    |
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| <b>Nosilec predmeta/Lecturer:</b> | Maruška Šubic-Kovač, Daniel Kozelj |
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| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni /Obligatory professional |
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| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

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| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b> |
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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Pojem, pomen in vloga komunalnih dejavnosti; komunalna infrastruktura: pojmovna opredelitev; kot del premoženja lokalnih skupnosti. Opredelitev ciljev trajnostnega razvoja na nivoju pristojnosti lokalnih skupnosti. Upravljanje komunalne infrastrukturne za doseganje trajnostnih ciljev ter učinkovite in uspešne gospodarske javne službe (ukrepi energetske optimizacije in proces prilagajanja na podnebne spremembe z elementi tveganja pri upravljanju komunalne dejavnosti). Stroškovni vidiki izvajanja komunalnih dejavnosti: amortizacija, cene za komunalne proizvode in | Concept, meaning, and role of municipal utility services; municipal (technical) infrastructure: definition of the concept as part of local community assets. Defining the goals of sustainable development at the level of local communities. Municipal infrastructure asset management for sustainable and efficient public utility services (measures of energy optimization and climate change adoption with elements of risk-based management of public utilities). Cost aspects of municipal economics activities: depreciation, prices |

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| <p>storitve; organiziranost izvajanja gospodarskih javnih služb.</p> <p>Gradnja objektov kot del upravnih postopkov; načela in prvine upravnega postopka; gradbeno in uporabno dovoljenje: vsebina, postopek pridobitve; prostorski akti: vrste, vsebina in njihov pomen pri predpisovanju lokacijskih pogojev; stvarne pravice na nepremičninah in njihova vloga pri pridobivanju gradbenega dovoljenja; opremljanje zemljišč za gradnjo; uporaba digitalnega poslovanja na področju prostorskega načrtovanja in graditve objektov; digitalizirani procesi, odprte zbirke javnih prostorskih podatkov.</p> | <p>for communal products and services; organisation of public utilities.</p> <p>Building construction from the administrative point of view (principles and elements of; administrative procedure); building and operating permit: contents; procedure for their acquisition; spatial documents: types, contents, and their importance for defining location conditions for building construction; material rights on real estates and their role in the process of building permit acquisition; building land development and its cost implication; use of digital procedures in spatial planning and building construction.</p> |
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**Temeljna literatura in viri/Readings:**

Izbrana poglavja iz:

Rakar, A. 2013. Komunalno gospodarstvo in gradbena zakonodaja: študijsko gradivo. Ljubljana, UL FGG, 132 strani.

Polajnar, M. 2013. Komunalno gospodarstvo in gradbena zakonodaja: študijsko gradivo za vaje. Ljubljana, UL FGG, prosojnice.

Aktualni pravni predpisi z obravnavanega področja.

**Cilji in kompetence:**

Cilji:

- seznaniti študenta s posebnostmi komunalnega gospodarstva in najpomembnejšo gradbeno zakonodajo.

Predmetnospecifične kompetence:

- poznavanje in razumevanje pomena in vloge ter ekonomskih in organizacijskih vidikov delovanja komunalnih dejavnosti,

- poznavanje in razumevanje pomena upravljanja lokalne gospodarske javne infrastrukture za trajnostno ter učinkovito in uspešno delovanje gospodarskih javnih služb,

- poznavanje pristopov trajnostne rabe virov, prilagajanje izvajanja gospodarskih javnih služb na podnebne spremembe in upravljanje s tveganji na področju komunalnih dejavnosti,

- poznavanje in razumevanje pomena in vloge regulacijskih mehanizmov pri gradnji objektov in drugih posegov v prostor,

**Objectives and competences:**

Objectives:

- to familiarise student with specifics of municipal economics and the basics of construction legislation.

Competences:

- to know and understand economic and organisational aspects of public utilities,

- awareness of the importance of municipal infrastructure asset management for sustainable and efficient public utility services,

- understanding of sustainable use of resources, the adaptation of public services to climate changes, and risk-based management of public utility services,

- knowledge regarding the meaning and the role of regulatory mechanisms in building construction,

- mastering the process of obtaining building/operating permit,

- awareness regarding material rights in real estates and their role in the process of building permit acquisition,

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>- poznavanje in obvladovanje procesa pridobitve gradbenega in uporabnega dovoljenja pri gradnji objektov,</li> <li>- poznavanje in razumevanje vsebine lastninskih in drugih stvarnih pravic na nepremičnini ter načine njihove pridobitve,</li> <li>- seznanitev s procesom opremljanja zemljišč za gradnjo in razumevanje njegovih stroškovnih posledic,</li> <li>- seznanitev s procesi digitalnega poslovanja na področju prostorskega načrtovanja in graditve objektov.</li> </ul> | <ul style="list-style-type: none"> <li>- knowledge regarding building land development and understanding its cost implications,</li> <li>- getting acquainted with digital procedures in the spatial planning and building construction sector.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Študent</p> <ul style="list-style-type: none"> <li>- bo sposoben identificirati posebnosti na področju ekonomike in organizacije neprofitnega sektorja ter sodelovati v postopku odločanja,</li> <li>- bo usposobljen za normiranje del in kalkulacijo stroškov izvajanja posamezne komunalne dejavnosti ter za prihajajoče digitalizirane procese priprave potrebnih listin v postopku pridobitve gradbenega dovoljenja,</li> <li>- bo sposoben za sodelovanje pri upravljanju komunalne infrastrukture z jasnim razumevanjem vpliva stanja infrastrukture na dobo koristnosti in preostalo ekonomsko vrednost glede na zahtevano raven oskrbe,- bo usposobljen za kritično presojo potreb in možnosti za privatizacijo infrastrukturnih dejavnosti ter morebitno pogodbeno urejanje v upravnih postopkih,</li> <li>- bo usposobljen za pridobivanje podatkov, analizo in predstavitev rezultatov na področju ekonomike in organizacije neprofitnega sektorja (na primer: določanje cen komunalnih storitev),</li> <li>- bo usposobljen za sodelovanje v interdisciplinarno sestavljenih skupinah s področja komunalnega gospodarstva in gradbene zakonodaje.</li> </ul> | <p>Student</p> <ul style="list-style-type: none"> <li>- will be able to identify basic characteristics in the field of municipal economics and organisation of the non-profit sector and will be able to participate in the decision-making process,</li> <li>- will be able to scale and calculate costs of public utility services and to prepare upcoming digitalization of processes for obtaining necessary documents in the process of building permit acquisition,</li> <li>- will be able to participate manage the public utility infrastructure with an understanding of the impact of infrastructure condition assessment on the useful life and residual economic value concerning the required level of service,</li> <li>- will be able to consider critically the needs and possibilities for privatization of public utilities and public service infrastructure and eventual contractual arrangements in administrative procedures,</li> <li>- will be able to acquire data, analyze data, and present analysis results in the field of municipal economics and organisation of the non-profit sector (for example pricing of public utility services),</li> <li>- will be able to cooperate with other experts in multidisciplinary teams in the field of municipal economics and construction legislation.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**



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| Predavanja in vaje v predavalnici, uporaba sodobnih metod poučevanja (grafične ponazoritve, demonstracij na učnem/laboratorijskem poligonu s komunalno infrastrukturo (vodne storitve) s prikazom zajema digitalne analize podatkov, digitalni prostorski podatkovni viri, primeri iz prakse), seminarske vaje. | Lectures in the classroom and practical work in computer classrooms with modern IT equipment (graphical presentations, demonstrations on learning/laboratory polygons of public utility infrastructure (water services) with demonstration of data acquisition and analysis, digital spatial data sources, practical cases), tutorials. |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                       |         |                          |
|-----------------------|---------|--------------------------|
| Računski del izpita   | 50,00 % | Practical exercises      |
| Teoretični del izpita | 50,00 % | Theoretical part of exam |

**Reference nosilca/Lecturer's references:**

ŠUBIC KOVAČ, Maruška. Analysis of expert bases for levying municipal contribution in Slovenia, taking into account fundamental principles. V: HEPERLE, Erwin (ur.). Methods and concepts of land management : diversity, changes and new approaches, (European Academy of land use and Development - EALD). 1. Aufl. Zürich: Hochschulverlag. 2020, str. 293-306, ilustr. <https://vdf.ch/methods-and-concepts-of-land-management.html>, <https://www.research-collection.ethz.ch/handle/20.500.11850/445042>, doi: 10.3929/ethz-b-000445042.

STOPAR, Iris, ŠUBIC KOVAČ, Maruška. Vrednotenje zemljišč v primeru stvarne služnosti : študija primera v Sloveniji = Land valuation in case of easement : the case study in Slovenia. Geodetski vestnik : glasilo Zveze geodetov Slovenije, ISSN 0351-0271. [Tiskana izd.], 2016, letn. 60, št. 4, str. 685-716, ilustr. [http://geodetski-vestnik.com/60/4/gv60-4\\_stopar.pdf](http://geodetski-vestnik.com/60/4/gv60-4_stopar.pdf), doi: 10.15292/geodetski-vestnik.2016.04.685-716.

ŠUBIC KOVAČ, Maruška. Acquisition of Land and Compensation in Infrastructure Projects in the Republic of Slovenia. V: HEPERLE, Erwin (ur.), LISEC, Anka (ur.). Opportunities and Constraints of Land Management in Local and Regional Development : Integrated Knowledge, Factors and trade-offs. 1. Aufl. Zürich: Hochschulverlag. 2018, str. 187-201. <https://www.research-collection.ethz.ch/handle/20.500.11850/289657>.

KAFOL STOJANOVIĆ, Ajda, KOZELJ, Daniel, ŠUBIC KOVAČ, Maruška. Assessment of water distribution system capacity as settlement-development decision-making expert basis at the local level = Ocena zmogljivosti vodovodnega sistema kot strokovna podlaga za odločanje o usmerjanju razvoja naselij na lokalni ravni. Geodetski vestnik : glasilo Zveze geodetov Slovenije, ISSN 0351-0271. [Tiskana izd.], 2020, letn. 64, št. 3, str. 389-401, ilustr.

KOZELJ, Daniel, RAK, Gašper, ŠKERJANEC, Mateja, ČENČUR CURK, Barbara, TORKAR, Anja, VALENČIČ, Urška, BRAČIČ-ŽELEZNIK, Branka, SIMONETI, Maja, LUKŠIČ, Andrej, VILHAR, Urša, KOZAMERNIK, Erika, JANŽA, Mitja, VAHTAR, Marta. Camaro-D : sodelovanje deležnikov pri uvajanju naprednih praks gospodarjenja s prostorom z vidika vplivov na vodni režim v povodju Donave : slovensko pilotno območje: Iška in Iški vršaj na Ljubljanskem barju - napajalno območje vodarne Brest. Ljubljana: Fakulteta za gradbeništvo in geodezijo: Naravoslovnotehniška fakulteta: Vodovod kanalizacija snaga, 2019. 51 str., ilustr.

RAK, Gašper, ŠKERJANEC, Mateja, BRAČIČ-ŽELEZNIK, Branka, KOZELJ, Daniel. Vpliv spremembe rabe tal na poplavno nevarnost in oskrbo z vodo = Impact of land use changes on flood risk and water supply. Ujma : revija za vprašanja varstva pred naravnimi in drugimi nesrečami, ISSN 0353-085X, 2019, št. 33, str. 168-178, ilustr.



## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                    |
|----------------------|--------------------|
| <b>Predmet:</b>      |                    |
|                      | <b>STAVBARSTVO</b> |
| <b>Course title:</b> |                    |
|                      | <b>BUILDINGS</b>   |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 1. letnik | Zimski   |

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|------------------------------------------------------------|-----|
| <b>Univerzitetna koda predmeta/University course code:</b> | 968 |
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| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 60         | 15      | 0    | 45            | 0                    | 120             | 8    |

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| <b>Nosilec predmeta/Lecturer:</b> | Mitja Košir |
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| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni /Obligatory professional |
|------------------------------------|--------------------------------------------|

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| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

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| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b> |
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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <p>Sistem: grajeno okolje v naravnem okolju. Metodologija inženirskega oblikovanja.</p> <p>Struktura temeljnih pravnih okvirov oblikovanja bivalnega in delovnega okolja: zgodovina, EC, SI.</p> <p>Modularna koordinacija. Geneza nosilne konstrukcije. Gradbeno fizikalne zahteve na osnovi funkcionalne analize aktivnih prostorov.</p> <p>Oprelitev pojma funkcionalnih con: konstrukcijskih sklopov v okviru sistema material - struktura - prostor. Identifikacija in specifikacija funkcionalnih con: konstrukcijskih sklopov na</p> | <p>System: the relationship between built and natural environment. Methodology of engineering design.</p> <p>Basic legal framework governing the field of living and working environment design: history, EC, SI.</p> <p>Modular coordination. Load bearing construction genesis. Definition of building physics requirements based on functional analysis of active spaces.</p> <p>Definition of functional zones: constructional complexes in the framework of material – structure – space system. Identification and specification of functional zones: constructional complexes in the</p> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <p>zgradbi. Osnovne matrike: NK-TI, NK-HI, NK-TI-HI. Funkcionalna analiza do opisa za izvedbo. Računanje prehoda toplote in difuzije vodne pare (stacionarno). Dimenzioniranje TI in parne ovire.</p> <p>Splošno fasadni pas – vertikalni in horizontalni, po vrstah stavb, iteracijski postopek do merila 1:20. Križanja: zunanja stena – streha, zunanja stena – medetažna konstrukcija, zunanja stena – tla na terenu, streha – notranja delitev, notranja delitev – medetažna konstrukcija, tla na terenu – notranja delitev, neprozorni – prozorni konstrukcijski sklop, preboji, dimniki, zračniki,...</p> <p>Linijske toplotne izgube (kondukcija). Prenos izbranih sistemov iz križanj konstrukcijskih sklopov iz merila 1:20 na merilo 1:5 do 1:1. Geneza iz funkcionalnih shem, sistemov in križanj do načrta in opisa za izvedbo.</p> | <p>building. Basic matrix load bearing function (LB) - moisture retention function (MR) - heat retention function (HR). Functional design of constructional complexes; from abstract concept to final description for execution. Simplified calculations of heat transfer (steady state U value calculation) and simplified method for positioning water vapour barrier. Thermal insulation specification calculation.</p> <p>Façade section - vertical and horizontal, according to building types, iterative design process to the scale of 1:20. Constructional complex contacts (crossings), by type: external wall - roof, external wall – internal floor, external wall – ground floor, roof – internal wall, internal wall – internal floor, ground floor – internal wall, opaque elements – transparent elements (windows, doors ...), chimneys, vents ...</p> <p>Linear heat losses (conduction). Detailed treatment of selected parts of the façade section. Transfer from 1:20 scale to 1:5 and/or 1:1 scale – detailing. Genesis of building envelope from functional schemes, systems, and constructional complex contacts to the description for execution.</p> |
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#### Temeljna literatura in viri/Readings:

Schittich, C., Lang, W., Krippner, R. 2006. Building Skins. Birkhäuser.

Neufert, E. 2008. Projektiranje v stavbarstvu : osnove, standardi, predpisi za konstrukcije, gradnja, oblikovanje, potrebni prostor, namembnost prostorov, mere zgradb, prostorov in opreme – s človekom kot merilom in ciljem : priročnik za projektante, izvajalce in študente. Ljubljana, Tehniška založba Slovenije. 550 str.

Deplazes, A. (urednik) 2013. Constructional architecture: materials, processes, structures: a handbook. 3rd ed. Basel, Birkhauser. 587 str.

Krainer, A. 2002. Modularna koordinacija. Modul 1, Konstrukcijski sklopi 3. UL FGG. 19 str.

Krainer, A. 2002. Strehe. Modul 1, Konstrukcijski sklopi 4. Ljubljana, UL FGG. 34 str.

Študijsko gradivo dostopno na: e-učilnici UL FGG.

#### Cilji in kompetence:

Cilji:

- usposobiti študenta za načrtovanje, dimenzioniranje in analiziranje zaščitne funkcije konstrukcijskih sklopov v odvisnosti od zahtev notranjega bivalnega in delovnega okolja ter razmer v zunanjem, naravnem okolju.

Predmetnospecifične kompetence:

#### Objectives and competences:

Objectives:

- to enable students for planning, design and analysis of envelope functions of constructional complexes in regards to the requirements of the internal living and working environments as well as to the conditions in the external (natural) environment.

Competences:

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <ul style="list-style-type: none"> <li>- študent pozna konstitutivne elemente in procese, ki definirajo položaj umetnega okolja v naravnem okolju z upoštevanjem principa kontinuuma prostora in časa,</li> <li>- je sposoben oblikovati kontekstne sheme na ravni identifikacije problemov, ki izhajajo iz funkcionalne analize aktivnih prostorov in so osnova za izvedbo funkcionalnih con: konstrukcijskih sklopov (KS),</li> <li>- razume pojem "projekt" v okviru proizvodno potrošnega kroga,</li> <li>- obvlada specifikacijo zahtev za posamezen KS, oblikovanje KS od koncepta do recepta za izvedbo in dimenzioniranje zaščitnega ovoja.</li> </ul> | <ul style="list-style-type: none"> <li>- student is acquainted with constituent elements and processes that define the relation of built environment to natural environment, taking into account the principle of the continuum of space and time,</li> <li>- student is able to create a contextual scheme for identifying the problems arising from the functional analysis of active spaces, which are the basis for the design and creation of functional zones – constructional complexes,</li> <li>- understand the concept of "project" in the greater socio-economic context,</li> <li>- student is able to independently design and specify the structure of specific constructional complexes from conceptual design to final description for execution.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Študent</p> <ul style="list-style-type: none"> <li>- bo sposoben načrtovati, dimenzionirati in analizirati zaščitne funkcije konstrukcijskih sklopov v odvisnosti od zahtev notranjega bivalnega in delovnega okolja ter razmer v zunanjem, naravnem okolju,</li> <li>- bo razumel iteracijski proces inženirskega načrtovanja kot virtualne simulacije izvedbe v naravi na poti od abstraktnega do konkretnega,</li> <li>- bo sposoben uporabljati predstavljene postopke pri načrtovanju celovitih konstrukcijskih sklopov (v povezavi s sistemi nosilne konstrukcije, ki se obravnavajo v okviru "konstrukcij" stavb pri drugih predmetih) ter kritično oceniti izdelane projekte in proizvode,</li> <li>- bo sposoben pri reševanju načrtovalskih problemov samostojno uporabljati metodo funkcionalne analize konstrukcijskih sklopov (od abstraktnega k konkretnemu) ter s pomočjo itearkcijskega postopka doseči cilj: v naravi optimalno delujočega gradbenega sistema,</li> <li>- bo razumel vlogo, pomen in delovanje stavbnega ovoja kot ključnega elementa za doseganje kvalitetnega notranjega okolja kot tudi trajnih in trajnostnih stavb.</li> </ul> | <p>Student</p> <ul style="list-style-type: none"> <li>- will be able to design, analyse and specify functions of constructional complexes in relation to the requirements of internal living and working environment as well as to the climatic conditions in the external environment,</li> <li>- will understand the iteration process of engineering design as a virtual simulation of building from abstract towards concrete solutions,</li> <li>- will be able to apply the outlined procedures in the design of constructional complexes (in conjunction - with load bearing systems that are lectured in other courses), as well as critically asses projects and building products,</li> <li>- will be able to independently use the method of functional design of constructional complexes (from abstract concept to final description for execution) and through its iterative application reach the final goal of an optimally functioning building system,</li> <li>- will understand the role, importance and functioning of the building envelope as a key element for achieving quality internal environments as well as durable and sustainable buildings.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                  |                                          |
|--------------------------------------------------|------------------------------------------|
| Predavanja, seminar, seminarske vaje, delo doma. | Lectures, seminar, tutorials, home work. |
|--------------------------------------------------|------------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                 |         |              |
|-----------------|---------|--------------|
| Seminarske vaje | 60,00 % | Tutorials    |
| Pisni izpit     | 40,00 % | Written exam |

**Reference nosilca/Lecturer's references:**

KOŠIR, Mitja, KRAINER, Aleš, KRISTL, Živa. Integral control sistem of indoor environment in continuously occupied spaces. Autom. constr.. [Print ed.], 2012, letn. 21, št. 1, str. 199-209, ilustr., doi: 10.1016/j.autcon.2011.06.004.

HUDOBIVNIK, Blaž, PAJEK, Luka, KUNIČ, Roman, KOŠIR, Mitja. FEM thermal performance analysis of multi-layer external walls during typical summer conditions considering high intensity passive cooling. Applied energy. sept. 2016, letn. 178, str. 363-375, ilustr. ISSN 0306-2619. DOI: 10.1016/j.apenergy.2016.06.036.

KOŠIR, Mitja, GOSTIŠA, Tamara, KRISTL, Živa. Influence of architectural building envelope characteristics on energy performance in Central European climatic conditions. Journal of building engineering, ISSN 2352-7102. [Online ed.], jan. 2018, letn. 15, str. 278-288, ilustr., doi: 10.1016/j.job.2017.11.023.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                          |
|----------------------|------------------------------------------|
| <b>Predmet:</b>      |                                          |
|                      | <b>UVOD V GRADBENIŠTVO</b>               |
| <b>Course title:</b> |                                          |
|                      | <b>INTRODUCTION TO CIVIL ENGINEERING</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 1. letnik | Zimski   |

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|------------------------------------------------------------|-----|
| <b>Univerzitetna koda predmeta/University course code:</b> | 963 |
|------------------------------------------------------------|-----|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 45         | 0       | 0    | 0             | 0                    | 45              | 3    |

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|-----------------------------------|--|
| <b>Nosilec predmeta/Lecturer:</b> |  |
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| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni /Obligatory professional |
|------------------------------------|--------------------------------------------|

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| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

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|------------------------------------------------------------------------------|-----------------------|
| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b> |
|                                                                              |                       |

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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Zgodovina gradbeništva, interdisciplinarnost (povezava z znanostjo in drugimi strokami), strokovna terminologija, potek graditve od ideje do objekta po veljavni zakonodaji, vloga gradbeništva v družbi, vloga in odgovornost gradbenega inženirja, osnovni in trajnostni gradbeni materiali, tipi gradbenih objektov in tehnologije gradnje, trajnostne konstrukcijske in tehnološke rešitve v gradbeništvu, modro-zelena infrastruktura, pomen LCA analize pri trajnostnih rešitvah, zakonodaja na področju gradbeništva, naravno in grajeno okolje, trajnostna raba naravnih virov in prostora, | History of civil engineering; interdisciplinarity (connection to science and other engineering disciplines); professional terminology; construction from the idea to the finalized structure (in accordance with the current legislation); the role and importance of civil engineering in society; the role and responsibility of a civil engineer; basic and sustainable materials in civil engineering; basic types of structures and building technologies; sustainable structural and technological solutions in structural and civil engineering, blue-green infrastructure, the role of LCA analysis in sustainable solutions, |

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| trajnostna mobilnost, , organizacija gradbenega podjetja in gradbišča, iskanje informacij v repozitorijih in na spletu. | legislation in the field of civil engineering; natural and built environment; sustainable use of natural resources, sustainable land use, sustainable mobility; organisation of a construction company; and a construction site; finding information in repositories and on the internet. |
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**Temeljna literatura in viri/Readings:**

Izbrana poglavja iz:

Steinman, F., Gosar, L. 2008. Osnove gradbeništva, skripta. Ljubljana, UL FGG, 134 str.

Koler B., Lipar P., Steinman F., Kozelj D. 2013. Gradbeništvo in infrastruktura, skripta. Ljubljana, UL FGG, 173 str.

Humar, G. 2000. Slovenski mostovi 1. del. Ljubljana, Zaklad, 112 str.

Humar, G. 2002. Slovenski mostovi 2. del. Ljubljana, Zaklad, Ljubljana, 112 str.

Humar, G. 2004. Predori: iskanje svetlobe. Šempeter pri Novi Gorici, 136 str.

Fundamentals of sustainability in civil engineering, 2nd ed., 2020. CRC Press, 256 str.

Blue-green infrastructure, 2018. Palgrave Macmillan, 339 str.

Učno gradivo v spletni učilnici.

**Cilji in kompetence:**

Cilji:

- motivacija študentov za študij gradbeništva,
- seznanjanje z gradbeniškim izrazoslovjem, pomenom stroke, zakonodajo in odgovornostjo gradbenega inženirja,
- seznanjanje z osnovnimi materiali, konstrukcijami in tehnologijami gradnje,
- zavedanje pomena trajnostnih rešitev v gradbeništvu.

Kompetence:

- so sposobni komunicirati v gradbenem izrazoslovju,
- so sposobni poiskati informacije v repozitorijih in na spletu in jih uporabiti pri samostojnem delu,
- razumejo gradbeno zakonodajo, predpise in druge pravne podlage, ki definirajo obveznosti in odgovornost gradbenega inženirja,
- poznajo osnovno gradbeno in gradbiščno dokumentacijo, postopke projektiranja, dovoljevanja in gradnje,

**Objectives and competences:**

Objectives:

- motivation for studying civil engineering,
- acquaintance with professional terminology in civil engineering, with the role of civil engineering, legislation, and responsibility of the civil engineer,
- acquaintance with basic materials, structures, and technologies in civil engineering,
- awareness of the importance of sustainable solutions in civil and structural engineering.

Competences:

- the ability to communicate in professional terminology,
- the ability to find information in repositories and online and to use this information in their individual work,
- understanding legislation, regulations, and other legal bases in civil engineering defining the obligations and responsibilities of a civil engineer,
- knowing the basic design and construction site documentation, design, permitting, and construction procedures,



|                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                           |
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| <ul style="list-style-type: none"> <li>- poznajo osnovne in trajnostne materiale in tehnologije v gradbeništvu ter osnovne značilnosti in postopke trajnostne gradnje in trajnostne rabe virov,</li> <li>- so sposobni samostojno načrtovati enostavno trajnostno prenovalo stavb.</li> </ul> | <ul style="list-style-type: none"> <li>- they are aware of the basic and sustainable materials and technologies in civil and structural engineering, and the basic characteristics and procedures of sustainable construction and use of resources,</li> <li>- the ability to independently plan a simple sustainable renovation of buildings.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

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| <ul style="list-style-type: none"> <li>- poznavanje in razumevanje osnov gradbene stroke</li> <li>- obvladovanje iskanja informacij v sklopu veljavne zakonodaje s področja gradbeništvu in prostorskega načrtovanja</li> <li>- obvladovanje iskanja in navajanja znanstvenih in strokovnih virov</li> <li>- razumevanje pomena trajnostnih rešitev v gradbeništvu povezanih s področji naravnih virov, prostora, okolja in vpetosti gradbeništvu v sodobno družbo</li> <li>- spretnost sestavljanja strokovnega besedila</li> </ul> | <ul style="list-style-type: none"> <li>- understanding of the basics of civil and structural engineering</li> <li>- the ability to search for and find information in current legislation, from the field of civil engineering and spatial planning</li> <li>- the ability to search, find and correctly cite scientific and professional publication</li> <li>- understanding the importance of sustainable solutions in civil and structural engineering related to the areas of natural resources, space, the environment, and the integration of civil engineering into modern society</li> <li>- the ability to write professional texts</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                                                                                                 |                                                                                                                                  |
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| Predavanja, konzultacije, samostojna izdelava domačih nalog s področja trajnostne prenovalo stavb in trajnostne infrastrukture. | Lectures, consultations, and individual home projects on the sustainable renovation of buildings and sustainable infrastructure. |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

|               |         |                     |
|---------------|---------|---------------------|
| Domače naloge | 50,00 % | Homework projects   |
| Pisni izpit   | 50,00 % | Written examination |

**Reference nosilca/Lecturer's references:**

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## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                             |
|----------------------|-----------------------------|
| <b>Predmet:</b>      |                             |
|                      | <b>GEODEZIJA</b>            |
| <b>Course title:</b> |                             |
|                      | <b>GEODETIC ENGINEERING</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 1. letnik | Letni    |

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|------------------------------------------------------------|-----|
| <b>Univerzitetna koda predmeta/University course code:</b> | 967 |
|------------------------------------------------------------|-----|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 0    | 15            | 0                    | 45              | 3    |

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| <b>Nosilec predmeta/Lecturer:</b> | Dušan Kogoj |
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| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni/Obligatory professional |
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| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

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| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b> |
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| <b>Vsebina:</b>                                                                                                                                                                                                  | <b>Content (Syllabus outline):</b>                                                                                                                                                     |
| Definicija geodezije, področja geodezije, naloge geodezije. Oblika in dimenzije Zemlje.                                                                                                                          | Definition of geodesy, fields of geodesy (geodetic engineering), tasks of geodetic engineering.                                                                                        |
| Koordinatni sistemi, koordinate, kartografske projekcije.                                                                                                                                                        | Shape and dimensions of the Earth. Coordinate systems, coordinates, cartographic projections.                                                                                          |
| Geodetske mreže. Teorija geodetskih meritev (mere, osnovni pojmi teorije pogreškov in izravnave).                                                                                                                | Geodetic networks. Theory of geodetic surveying (measuring, basic principles of theory of errors and adjustment).                                                                      |
| Geodetske terestrične meritve (geodetsko orodje, merjenje kotov, merjenje dolžin, merjenje višinskih razlik, relativne merske metode). Sodobne merske tehnike in metode (TPS sistemi, 3D skenerji, GPS meritve). | Terrestrial surveying (tools, angle measurements, distance measurements, height difference measurements, relative measurement techniques). Modern measurement systems and techniques). |

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| <p>Osnovni principi določanja koordinat točk (merski in koordinatni prostor - izračun). Detaljna izmera (zajem prostorskih podatkov). Načrti in karte (značilnosti, načini izdelave, vrste, uporabnost).</p> <p>Geodetske evidence (zemljiški kataster, kataster stavb, DMR, GIS). Splošno o geodeziji pri gradnji objektov in drugih posegih v prostor (raba prostora, pridobivanje dovoljenj za posege, izvedba posega). Osnovne metode zakoličevanja</p> <p>Geodetska dela pri visokih gradnjah (zakoličba, spremljanje gradnje, ugotavljanje stabilnosti objekta – primeri iz prakse). Geodetska dela pri nizkih gradnjah (geodetske podlage, zakoličba, spremljanje gradnje, merjenja ob obremenilnih preizkušnjah, ugotavljanje stabilnosti in deformacij objekta – primeri iz prakse).</p> <p>Hidrografska merjenja.</p> | <p>methods (TPS systems, 3D scanners, GNSS measurements).</p> <p>Basic principles of point coordinate determination (observation and coordinate space - calculation). Detail surveying (spatial data acquisition). Plans and maps (characteristics, manufacturing methods, types, usability).</p> <p>Geodetic records (land cadastre, building cadastre, DTM, GIS). General about surveying in building construction and other spatial planning methods (land use, obtaining land use permits, implementation of intervention). Basic stakeout methods. Geodetic works for infrastructural engineering (stakeout, construction monitoring, determination of the stability of the building – practical examples).</p> <p>Geodetic work for infrastructural engineering (geodetic layers, stakeout, construction monitoring, measuring the load tests, determination of stability and deformation of a structure - practical examples).</p> <p>Hydrographic measurements.</p> |
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#### Temeljna literatura in viri/Readings:

Juvančič, I. 2000. Geodezija za gozdarje in krajinske arhitekte. Ljubljana, UL BF, Ljubljana.

Witte, B., Schmidt, H. 2006. Vermessungskunde und Grundlagen der Statistik für das Bauwesen. Heidelberg, Herbert Wichmann Verlag.

Kogoj, D. 2013. Geodezija za gradbenike in vodarje, FGG .pdf kopija. Ljubljana, Učna gradiva v spletni učilnici.

#### Cilji in kompetence:

Cilji:

- seznaniti študente z osnovnimi geodetskimi metodami izmere in geodetskimi proizvodi s poudarkom na praktičnih primerih uporabe geodezije v gradbeništvu in možnosti sodelovanja z geodeti, za naročanje in prevzemanje geodetskih produktov.

Predmetnospecifične kompetence:

- poznavanje in razumevanje osnovnega izrazoslovja s področja geodezije, poznavanje nalog in družbene pomembnosti geodezije, obvladovanje praktičnih primerov uporabe geodezije v gradbeništvu.

#### Objectives and competences:

Objectives:

- to acquaint students with basic geodetic surveying methods and geodetic products with the main stress on the practical examples on application in geodetic engineering – planning, design, construction and the possibilities of cooperation with geodetic experts, to order and to accept geodetic products.

Competences:

- skills and understanding of basic geodetic terminology, knowledge about social importance of geodesy in society, to master practical use of geodetic services in civil engineering.

**Predvideni študijski rezultati:**

- poznavanje geodezije kot vede in stroke, njenih področij, nalog in družbene pomembnosti
- razumevanje osnovnih geodetskih postopkov meritev in obdelave merskih vrednosti s poudarkom na razumevanju rezultatov geodetskih meritev in načini interpretacije le teh
- seznanitev s celotnim spektrom geodetskih proizvodov in razumevanje njihove uporabnosti v vodarstvu in okoljskem inženirstvu
- pridobljeno znanje je uporabno v smislu racionalne uporabe geodezije tako s stališča investitorja kot s stališča izvajalca, predvsem v smislu zagotavljanja visoke kvalitete opravljenih del
- razumevanje geodetskih postopkov in izdelkov omogoča kritično presojo kvalitete ter objektivno ovrednotenje skladnosti teoretičnih načel in praktičnega ravnanja

**Intended learning outcomes:**

- skills on geodesy and surveying as science and profession, its field of work, geodetic tasks and importance for modern society
- understanding of basic geodetic measurements and computations with the main stress on understanding the results of geodetic measurements and their interpretation
- getting acquainted with the whole spectrum of geodetic products and understanding of their applicability in water management and environmental engineering
- acquired knowledge is useful for rational use of geodetic products from the investors' points of view and in the process of project realization
- special stress is on the understanding of geodetic products which give an opportunity for critical view (judgment) of their quality and objective valuation of accordance between theoretical principles and practical proceedings.

**Metode poučevanja in učenja:**

Predavanja: prosojnice, grafične prezentacije, demonstracije, praktični primeri

Laboratorijske vaje: računalniška učilnica, uporaba terestričnih geodetskih instrumentov pri terenski izmeri.

**Learning and teaching methods:**

Lectures: slides, graphical presentations, demonstrations, practical examples.

Practical exercises: computer classroom, use of terrestrial geodetic instruments (total stations, GPS, levels) in field use.

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|       |         |             |
|-------|---------|-------------|
| Vaje  | 50,00 % | Tutorials   |
| Izpit | 50,00 % | Examination |

**Reference nosilca/Lecturer's references:**

KREGAR, Klemen, GRIGILLO, Dejan, KOGOJ, Dušan. High precision target center determination from a point cloud. V: SCAIONI, M. (ur.). ISPRS Annals Volume II-5/W2, 2013WG V/3, I/2, I/3, III/2, V/2, VII/7, ICWG I/Va ISPRS Workshop Laser Scanning 20131113 November 2013, Antalya, Turkey. [S. l.: s. n.], 2013, str. 139-144.

KREGAR, Klemen, LAKNER, Mitja, KOGOJ, Dušan. Rotacija z enotskim kvaternionom = Rotation with unit quaternion. Geodetski vestnik, 2014, letn. 58, št. 2, str. 231-242.

MARJETIČ, Aleš, KREGAR, Klemen, KOGOJ, Dušan. Geodetsko merjenje dolžin v atletiki = Geodetic measurement of distances in athletics. Geodetski vestnik, 2014, letn. 58, št. 2, str. 243-253.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                   |
|----------------------|-----------------------------------|
| <b>Predmet:</b>      |                                   |
|                      | <b>GIS IN PROSTORSKE EVIDENCE</b> |
| <b>Course title:</b> |                                   |
|                      | <b>GIS AND SPATIAL RECORDS</b>    |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 1. letnik | Letni    |

|                                                            |     |
|------------------------------------------------------------|-----|
| <b>Univerzitetna koda predmeta/University course code:</b> | 974 |
|------------------------------------------------------------|-----|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 15         | 15      | 15   | 0             | 0                    | 45              | 3    |

|                                   |              |
|-----------------------------------|--------------|
| <b>Nosilec predmeta/Lecturer:</b> | Marijan Žura |
|-----------------------------------|--------------|

|                                    |                                           |
|------------------------------------|-------------------------------------------|
| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni/Obligatory professional |
|------------------------------------|-------------------------------------------|

|                          |                      |             |
|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

|                                                                              |                       |
|------------------------------------------------------------------------------|-----------------------|
| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b> |
|                                                                              |                       |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Tehnologija; osnovni pojmi (sistem, informacijski sistem (IS), podatek, informacija, vrste IS, sestavine IS, definicija GIS); georeferenciranje; modeli realnega sveta; kartografski model, objektni model, topologija, dinamična segmentacija, časovni podatki, vnos, obdelava podatkov, proizvodnja; analize: mrežne, ploskovne, 3D, rastrske, prikazi podatkov, baze podatkov; organizacija: razvojno življenjski cikel: avtorske in sorodne pravice; standardizacija. Aplikacije: BCP. | Technology: basic terminology (system, information system (IS), datum, information, types of IS, components of IS, definition of GIS); georeferencing, models of real world; cartographic model, object model, topology, dynamic segmentation, temporal data, data input, editing, queries; analysis: network, spatial, 3D, raster, data presentation, databases; organization: development life cycle, royalties and related rights, standardization. Applications: RDB (Road Data Base). |

**Temeljna literatura in viri/Readings:**

Kvame, K., Oštir, K., Stančič, Z., Šumrada, R. 1997. Geografski informacijski sistemi, SAZU, 476 str.

**Cilji in kompetence:****Cilji:**

- študenti se seznani s tehnologijo GIS in z bazami prostorskih podatkov.

**Predmetnospecifične kompetence:**

- sposobnost izdelave kartografskega modela prostorskih podatkov,
- sposobnost izdelave relacijskega modela opisnih podatkov,
- razumevanje in sposobnost uporabe GIS tehnologije za vnos, ažuriranje in obdelavo prostorskih podatkov,
- obvladovanje izdelave prostorske analize ter prikazovanja rezultatov analiz v obliki tematskih kart.

**Objectives and competences:****Objectives:**

- students are acquainted with the technology of geographic information systems and spatial data bases.

**Competences:**

Students will be able to:

- develop cartographic model of spatial data,
- develop relational model of attribute data,
- understand and able to use GIS technology to enter, update and process spatial data,
- to conduct spatial analysis and to present results of the analyses in the form of thematic maps.

**Predvideni študijski rezultati:****Študent**

- bo sposoben uporabljati GIS tehnologije, zlasti GIS orodja (ArcGIS),
- bo znal uporabiti pridobljeno znanje na konkretnih primerih v praksi,
- na podlagi pridobljenih znanj in spoznanj bo kritično presojal potrebe in možnosti za reševanje problemov pri načrtovanju infrastrukturnih objektov,
- bo sposoben uporabljati GIS tehnologijo za reševanje problemov tudi na drugih področjih kot na primer pri prostorskih analizah in načrtovanju.

**Intended learning outcomes:****Student**

- will be able to use GIS technology, particularly ArcGIS software,
- will be able to use acquired knowledge to solve certain professional problems,
- on the basis of acquired knowledge he will be able to assess needs and possibilities for solving problems at infrastructure planning,
- will be able to use GIS technology for solving problems in other domains, for example at spatial analysis and planning.

**Metode poučevanja in učenja:**

Predavanja, seminar in vaje v računalniški učilnici.

**Learning and teaching methods:**

Lectures, seminar and tutorials in computer classroom.

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                       |         |                          |
|-----------------------|---------|--------------------------|
| Teoretični del izpita | 50,00 % | Theoretical part of exam |
| Računski del izpita   | 50,00 % | Practical part of exam   |

**Reference nosilca/Lecturer's references:**

MAHER, Tomaž, STRNAD, Irena, ŽURA, Marijan. Estimation of EVA mode choice model parameters with different types of utility functions. *Promet (Zagreb)*, 2011, vol. 23, no. 3, str. 169-175.

LIPAR, Peter, LAKNER, Mitja, MAHER, Tomaž, ŽURA, Marijan. Estimation of road centerline curvature from raw GPS data. *The Balt. J. road bridge eng.*, 2011, letn. 6, št. 3, str. 163-168, ilustr., doi: 10.3846/bjrbe.2011.21.

ŠELIH, Jana, KNE, Anžej, SRDIČ, Aleksander, ŽURA, Marijan. Multiple-criteria decision support system in highway infrastructure management. *Transport (Vilnius (Spausd.))*. [Print ed.], 2008, letn. 23, št. 4, str. 299-305, ilustr. Dostopno na: [http://www.transport.vgtu.lt./upload/tif\\_zur/2008-4-selih\\_kne\\_srdic\\_zura.pdf](http://www.transport.vgtu.lt./upload/tif_zur/2008-4-selih_kne_srdic_zura.pdf), doi: 10.3846/1648-4142.2008.23.299-305.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                            |
|----------------------|--------------------------------------------|
| <b>Predmet:</b>      |                                            |
|                      | <b>GRADIVA</b>                             |
| <b>Course title:</b> |                                            |
|                      | <b>CONSTRUCTION AND BUILDING MATERIALS</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 1. letnik | Letni    |

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|------------------------------------------------------------|-----|
| <b>Univerzitetna koda predmeta/University course code:</b> | 971 |
|------------------------------------------------------------|-----|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 45         | 0       | 0    | 45            | 0                    | 90              | 6    |

|                                   |                                            |
|-----------------------------------|--------------------------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Violeta Bokan-Bosiljkov , Vlatko Bosiljkov |
|-----------------------------------|--------------------------------------------|

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| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni/Obligatory professional |
|------------------------------------|-------------------------------------------|

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|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

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|------------------------------------------------------------------------------|-----------------------|
| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b> |
|                                                                              |                       |

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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <p>Osnove standardizacije in obravnava gradiv v standardih in predpisih za načrtovanje in gradnjo objektov (preskusni standardi, Uredba o gradbenih proizvodih, harmonizirani standardi, Evrokodi).</p> <p>Osnove kemičnih, fizikalnih in mehanskih lastnosti gradiv in njihovo opredeljevanje in kvantificiranje s pomočjo eksperimentalnih preiskav (kohezija, trdnost, trdota, deformabilnost, elastičnost, plastičnost, mehanizmi porušitve, trajnost vplivov).</p> <p>Keramična gradiva: kamen; gradbena keramika in steklo; mineralna veziva, malte; betoni.</p> | <p>Basics of standardization, construction, and building materials in standards and regulations for the design and construction of buildings and civil engineering structures (standardized testing methods, Construction Products Regulation, harmonized standards, Eurocodes).</p> <p>Fundamentals of chemical, physical, and mechanical properties of construction and building materials and their identification and quantification by means of testing (cohesion, strength, hardness,</p> |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Kovinska gradiva: železove kovine in neželezove kovine ter zlitine. Polimerna gradiva: umetne mase; ogljikovodikova gradiva. Kompozitna gradiva: umetna gradiva (z delci in vlaknasto armirane plastike, lastnosti, področja uporabe); naravna gradiva (les).</p> <p>Osnove recikliranja in energijske izrabe odpadnih gradiv po izteku njihove življenjske dobe. Uporaba sekundarnih surovin drugih industrij v gradbenih proizvodih.</p> <p>Posebnosti gradiv za dodajalne digitalne tehnologije na področju gradbeništva.</p> | <p>deformability, elasticity, plasticity, failure mechanisms, impact duration).</p> <p>Ceramics: stone; building ceramics and glass; mineral binders, mortars; concretes.</p> <p>Metals: ferrous and non-ferrous metals and metal alloys. Polymer materials: plastics; bitumen and asphalt. Composite materials: plastic composites (particle-and fiber-reinforced plastic, properties, application); natural building materials (wood).</p> <p>Basics of recycling and energy utilization of waste building materials after their useful life. Use of secondary materials from other industries in construction products.</p> <p>Properties of building materials for additive digital technologies in the construction sector.</p> |
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**Temeljna literatura in viri/Readings:**

Izbrana poglavja iz:

Žarnić, R. 2005. Osnove gradiv. Ljubljana, UL FGG, Katedra za PMK, 350 str.

Žarnić, R., Bokan-Bosiljkov, V., Bosiljkov, V. 2013. Gradiva – vaje. Ljubljana, UL FGG, Katedra za PMK, 146 str. - od tega 104 str. izbranih metod preiskav iz vaj 1 do 9.

Marios Soutsos, Peter Domone (urednika) 2017. Construction Materials – Their Nature and Behaviour, 5th edition, CRC Press, 820 strani – izbrana poglavja.

Učno gradivo v spletni učilnici.

**Cilji in kompetence:**

Cilji:

- študenta naučiti obvladovati znanja o tehničnih lastnostih gradiv in njihovi ekonomični uporabi ter recikliranju.

Predmetno specifične kompetence:

- poznavanje metod projektiranja gradiv (beton, malte, kompoziti),
- usposobitev za preverjanje lastnosti gradiv in klasifikacije kakovosti s pomočjo standardnih metod laboratorijskih in terenskih preiskav,
- poznavanje procesov proizvodnje gradbenih materialov,
- obvladovanje tehnik preverjanja lastnosti gradiv,
- poznavanje osnov krožnega gospodarstva v gradbeništvu.

**Objectives and competences:**

Objectives:

- to teach students to manage knowledge about the technical properties of construction and building materials and their economical use and recycling.

Competences:

- student has knowledge about methods to design mortar, concrete or composite materials,
- student is trained to check the properties of construction and building materials and for their classification by using standard laboratory and in-situ test methods,
- student knows the technology of construction and building materials production,
- student manages techniques for the evaluation of material properties.

|  |                                                                 |
|--|-----------------------------------------------------------------|
|  | - student knows the basics of circular economy in construction. |
|--|-----------------------------------------------------------------|

**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Študent</p> <ul style="list-style-type: none"> <li>- bo sposoben klasificirati gradiva ter uporabljati osnovne standarde in zakonodajo s tega področja,</li> <li>- bo sposoben razumeti povezavo med strukturo in teksturo gradiva ter njegovimi mehanskimi fizikalnimi in tehnološkimi lastnostmi,</li> <li>- bo sposoben razumeti osnovne postopke projektiranja malt, betonov in asfaltov,</li> <li>- bo sposoben izvesti preproste preiskave gradiv in rezultate ovrednotiti,</li> <li>- bo sposoben izbrati ustrezno gradivo glede na predpisane zahteve,</li> <li>- bo sposoben naslavljal problematiko varovanja naravnih virov z uporabo recikliranih materialov in optimiziranjem proizvodov z dodajalnimi digitalnimi tehnologijami,</li> <li>- bo sposoben pri svojem delu uporabiti domačo in tujo literaturo s področja gradiv,</li> <li>- bo sposoben za timsko delo v laboratoriju.</li> </ul> | <p>Student</p> <ul style="list-style-type: none"> <li>- will be able to classify construction and building materials and to use basic standards and legislation regulations from the field of interest,</li> <li>- will be able to understand the relationship between structure and texture of construction and building material and their mechanical, physical, and technological properties,</li> <li>- will be able to understand basic design procedures for mortars, concretes, and asphalts,</li> <li>- will be able to carry out basic tests on construction and building materials and to evaluate obtained results,</li> <li>- will be able to select appropriate construction and building material that will meet prerequisite requirements,</li> <li>- will be able to address the issue of natural resources saving by using recycled materials and optimizing products with additive digital technologies,</li> <li>- will be able to use both domestic and foreign literature regarding construction and building materials at his/her work,</li> <li>- will be able to perform teamwork in the laboratory.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                  |                                          |
|----------------------------------|------------------------------------------|
| Predavanja, laboratorijske vaje. | Lectures, laboratory exercises/tutorials |
|----------------------------------|------------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                           |         |                            |
|---------------------------|---------|----------------------------|
| Dva kolokvija ali izpit   | 70,00 % | Two mid-term exams or exam |
| Ocena laboratorijskih vaj | 30,00 % | The log book               |

**Reference nosilca/Lecturer's references:**

URANJEK, Mojmir, BOSILJKOV, Vlatko, ŽARNIČ, Roko, BOKAN-BOSILJKOV, Violeta. In situ tests and seismic assessment of a stone-masonry building. Mat. struct., 2012, letn. 45, št. 6, str. 861-879, ilustr., doi: 10.1617/s11527-011-9804-z.

BOSILJKOV, Vlatko, URANJEK, Mojmir, ŽARNIĆ, Roko, BOKAN-BOSILJKOV, Violeta. An integrated diagnostic approach for the assessment of historic masonry structures. J. cult. herit., 2010, letn. 11, št. 3, str. 239-249, ilustr., doi: 10.1016/j.culher.2009.11.007.

CAMATA, Guido, SPACONE, Enrico, ŽARNIĆ, Roko. Experimental and nonlinear finite element studies of RC beams strengthened with FRP plates. Compos., Part B Eng.. [Print ed.], 2007, letn. 38, št. 2, str. 278-288, ilustr. DUH, David, ŽARNIĆ, Roko, BOKAN-BOSILJKOV, Violeta. Strategies for finding the adequate air void threshold value in computer assisted determination of air void characteristics in hardened concrete. Comput. Concr. Int. J. (Print), april 2008, letn. 5, št. 2, str. 101-116, ilustr.

URANJEK, Mojmir, BOSILJKOV, Vlatko, ŽARNIĆ, Roko, BOKAN-BOSILJKOV, Violeta. In situ tests and seismic assessment of a stone-masonry building. Mat. struct., 2012, letn. 45, št. 6, str. 861-879, ilustr., doi: 10.1617/s11527-011-9804-z.

BOSILJKOV, Vlatko, URANJEK, Mojmir, ŽARNIĆ, Roko, BOKAN-BOSILJKOV, Violeta. An integrated diagnostic approach for the assessment of historic masonry structures. J. cult. herit., 2010, letn. 11, št. 3, str. 239-249, ilustr., doi: 10.1016/j.culher.2009.11.007.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                      |
|----------------------|--------------------------------------|
| <b>Predmet:</b>      |                                      |
|                      | <b>HIDROMEKANIKA IN HIDRAVLIKA</b>   |
| <b>Course title:</b> |                                      |
|                      | <b>HYDROMECHANICS AND HYDRAULICS</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 1. letnik | Letni    |

|                                                            |     |
|------------------------------------------------------------|-----|
| <b>Univerzitetna koda predmeta/University course code:</b> | 970 |
|------------------------------------------------------------|-----|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 45         | 15      | 0    | 30            | 0                    | 90              | 6    |

|                                   |                                         |
|-----------------------------------|-----------------------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Gašper Rak, Gorazd Novak, Matjaž Četina |
|-----------------------------------|-----------------------------------------|

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|------------------------------------|-------------------------------------------|
| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni/Obligatory professional |
|------------------------------------|-------------------------------------------|

|                          |                      |             |
|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

|                                                                              |                       |
|------------------------------------------------------------------------------|-----------------------|
| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b> |
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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Fizikalne lastnosti tekočin. Kontinuitetna, dinamična in enačba stanja za tekočine ter princip reševanja osnovnih enačb. Hidrostatika: sile in prijemališča na ravne in ukrivljene ploskve, vzgon in plavanje. Kinematika idealne nestisljive tekočine: tokovnice, trajektorije, sledi, vrtnični in nevrtnični (potencialni) tok. Dinamika idealne nestisljive tekočine: Bernoullijeva in energijska enačba, impulzni stavek, tok podtalnice v poroznem prostoru. Tok realne tekočine: laminarni in turbulentni tok, mejna plast, upor teles. | Physical properties of fluids. Continuity, dynamic, and equation of state for fluids, the principle of solving basic equations. Hydrostatics: forces and their points of application on flat and curved plains, buoyancy, and floating. Kinematics of ideal incompressible fluid: streamlines, path lines, streak lines, rotational and irrotational (potential) flow. Dynamics of ideal incompressible fluid: Bernoulli and energy equation, momentum theorem, groundwater flow in porous media. The flow of real fluid: dynamic similarity, laminar and turbulent flow, boundary layer, fluid drag. |

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| <p>Podana so osnovna znanja za razumevanje in preračun hidravličnih razmer toka v cevovodih, stalnega neenakomernega toka s prosto gladino in najnujnejše navezave na hidravlično dimenzioniranje objektov.</p> <p>Vsebinska obsega osnovne enačbe realne tekočine za opis stanja hidravličnih sistemov in robnih pogojev.</p> <p>Tok v cevovodih obravnava stalni enakomerni tok, določevanje trenjskih in običajnih lokalnih izgub, hidravlika črpalk. Ob stalnem enakomernem in stalnem neenakomernem toku v odprtih vodotokih bo dan še izračun energije prereza in določanje kritične globine za različne oblike prečnih prevezov.</p> <p>Obravnavani bodo osnovni mehanizmi in pogoji za stabilne odseke vodotokov.</p> <p>Znanja s predavanj bodo računsko predstavljena s pomočjo seminarskih vaj, najpomembnejši procesi pa z laboratorijskimi vajami v okviru katerih bodo študentje spoznali tudi osnove digitalizacije merjenja in modeliranja procesov. V okviru teh študentje v manjših skupinah spremljajo meritve na hidravličnih modelih ter tako spoznajo inženirske procese, nastale zaradi toka tekočine.</p> | <p>Basic knowledge to understand and calculate hydraulic conditions in conduits, steady non-uniform free surface flow, and most important connections with the design of hydraulic structures.</p> <p>The content includes basic equations of real fluid to describe the state of hydraulic systems and boundary conditions.</p> <p>Flow in conduits deals with the steady uniform flow, determination of friction and most common local losses, hydraulics of pumps. In addition to steady uniform and non-uniform flow in open channels, the calculation of cross-section energy and the determination of critical depth for different cross-section shapes will be given.</p> <p>Basic mechanisms and conditions for stable river sections will be considered.</p> <p>The knowledge obtained during lectures will be presented computationally with seminar tutorials and basic processes with laboratory tutorials, in the framework of which fundamentals of measurement digitalization and modelling will be introduced. During these students in smaller groups attend to measurements on hydraulic models and find out engineering processes that occur due to fluid flow.</p> |
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#### Temeljna literatura in viri/Readings:

Izbrana poglavja iz:

Rajar, R. 1997. Hidromehanika, učbenik. Ljubljana, UL FGG, str. 1-8, 32-40, 52-82, 91-136, 138-175, 184-191, 206-236.

Steinman, F. 2010. Hidravlika, učbenik. Ljubljana, UL FGG, str. 1-102, 131-198 in 244-267.

Chadwick, A.J. 2013. Hydraulics in Civil and environmental engineering. Spon Press, 664 strani.

Četina, M. 1997. Zbirka rešenih nalog iz hidromehanike, študijsko gradivo na mreži. Ljubljana, UL FGG, 245 strani.

Žagar, D., Četina, M. 2002. Vaje iz hidravlike (I., II. In III. Del), študijsko gradivo na mreži. Ljubljana, UL FGG, 80 strani.

#### Cilji in kompetence:

Cilji:

- spoznati, razumeti in naučiti se uporabljati osnovne enačbe mehanike tekočin,
- razumeti praktično uporabnost osnovnih enačb mehanike tekočin s ciljem doseganja trajnostne rabe vodnih virov.

#### Objectives and competences:

Objectives:

- to recognize, understand and learn how to use basic equations of fluid mechanics,
- understand the practical applicability of the basic equations of fluid mechanics with the goal of achieving sustainable use of water resources.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| <p><b>Predmetnospecifične kompetence:</b></p> <ul style="list-style-type: none"> <li>- razumevanje poenostavitev splošnih enačb in obvladovanje določevanja hidrostatičnih sil in njihovih prijemališč na objekte ter presojanja stabilnost plavanja,</li> <li>- poznavanje zakonitosti gibanja idealne tekočine kot osnove za kasnejšo obravnavo realne tekočine pri hidravliki,</li> <li>- obvladovanje osnovnih znanj o potencialnem toku in njegovi uporabi za tok podtalnice,</li> <li>- poznavanje osnovnih zakonitosti toka realne tekočine, zlasti razumevanje razlike med laminarnim in turbulentnim tokom,</li> <li>- obvladovanje osnovnih izračunov, kadar se gradbeni objekti navezujejo na vodotoke (npr. oporni zidovi) ali pa je treba prečrpavati vodo zaradi gradnje v suhem (po sistemu cevovodov),</li> <li>- osnovno poznavanje hidravlike toka realne tekočine v vodotokih s prosto gladino in v cevovodih pod tlakom,</li> <li>- osnove meritev v hidromehaniki in hidravliki.</li> </ul> | <p><b>Competences:</b></p> <ul style="list-style-type: none"> <li>- understanding simplifications of general equations and knowledge of how to determine hydrostatic forces and their points of application on structures and how to assess the stability of floating bodies,</li> <li>- being acquainted with the principles of the movement of ideal fluid as a basis for later consideration of real fluid in hydraulics,</li> <li>- having basic knowledge about the potential flow and its application for groundwater flow,</li> <li>- being acquainted with basic principles of real fluid flow, especially to understand differences between laminar and turbulent flow,</li> <li>- having knowledge about basic calculations in cases where engineering structures are connected with open channels (e.g. retaining walls) or it is necessary to pump water to have a dry building environment (through pipeline systems),</li> <li>- basic knowledge of real fluid flow in open channels and in pressurized pipes,</li> <li>- basics of measurements in hydromechanics and hydraulics.</li> </ul> |
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**Predvideni študijski rezultati:****Študent**

- bo sposoben pri svojem delu uporabiti ustrezne enačbe pri reševanju praktičnih problemov določanja sil in prijemališč zaradi hidrostatičnega tlaka na zapornice, pregrade in nasipe,
- bo znal uporabiti teorijo potencialnega toka za preračun enostavnejših primerov toka podtalnice,
- bo znal hidravlične enačbe toka realne tekočine uporabiti za enostavne izračune za spremljajoče ukrepe na gradbišču, preliminarne izračune potrebnih objektov in elementov (npr. črpalk) za dovod in odvod vode in za prevzemanje hidravličnih obremenitev (tlaki, hitrosti, strigi ipd.),
- bo sposoben izračunati enostavne hidravlične primere, razumeti robne pogoje in presoditi področja uporabe oziroma meje poenostavitev in (ne)natančnosti izračunov,
- bo preko praktičnih primerov spoznal vlogo hidrotehničnih objektov in elementov ter njihovo

**Intended learning outcomes:****Student**

- will be able to use appropriate equations at his work to solve practical problems of determining forces and their points of application due to hydrostatic pressure on gates, dams, and dykes,
- will know how to use the theory of potential flow to calculate simpler cases of groundwater flow,
- will know how to use hydraulic equations of the flow of a real fluid for simple computations and accompanying measures on the building site, preliminary calculations of necessary structures and elements (e.g. pumps) to supply and discharge water and to bear hydraulic loads (pressures, velocities, shears, etc.),
- will be able to compute simple hydraulic cases, understand boundary conditions, and assess fields of application and limits of simplifications including the accuracy of computations,
- through practical examples, will learn about the role of hydro-technical facilities and elements and

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| vlogo pri prehodu k trajnostnemu ravnanju z vodnimi viri,<br><br>- bo spoznal vlogo informatizacije in digitalizacije pri razumevanju pojavov vodnega toka in njuno praktično aplikacijo. | their role in the transition to sustainable management of water resources,<br><br>- will learn about the role of informatics and digital transformation in understanding water flow phenomena and their practical application. |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| Predavanja in seminar bodo poleg za razumevanje snovi potrebnih teoretičnih osnov vsebovala praktične primere toka tekočin.<br><br>Laboratorijske vaje bodo pripomogle k utrjevanju in razumevanju snovi, preko spremljanja meritev v laboratoriju pa bodo študentje videli in razumeli, "kako voda teče" in hkrati spoznavali intenzivnost procesov. | In addition to the necessary theoretical basis needed for understanding the learning material, lectures and seminar will also contain practical cases of fluid flow.<br><br>Laboratory tutorials will help consolidate and understand the material and by attending the measurements in the laboratory, where students will see and understand »how water flows« and at the same time they will recognize the intensity of processes. |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                               |         |                                          |
|-------------------------------|---------|------------------------------------------|
| Seminarska naloga (pisno)     | 20,00 % | Seminar work (written)                   |
| Teoretični del izpita (pisni) | 30,00 % | Theoretical part of the exam (written)   |
| Računski del izpita (pisni)   | 50,00 % | Computational part of the exam (written) |

**Reference nosilca/Lecturer's references:**

KRZYK, Mario, ČETINA, Matjaž. Analysis of flow in a curved channel using the curvilinear orthogonal numerical mesh. *Strojniški vestnik*. Sep. 2018, vol. 64, no. 9, str. 536-542. DOI: 10.5545/sv-jme.2017.5183.

BOMBAČ, Martin, NOVAK, Gorazd, MLAČNIK, Jure, ČETINA, Matjaž. Extensive field measurements of flow in vertical slot fishway as data for validation of numerical simulations. *Ecological engineering*. [Print ed.]. 2015, letn. 84, str. 476-484. DOI: 10.1016/j.ecoleng.2015.09.030.

BOMBAČ, Martin, NOVAK, Gorazd, RODIČ, Primož, ČETINA, Matjaž. Numerical and physical model study of a vertical slot fishway. *Journal of Hydrology and Hydromechanics*. [Tiskana izd.]. 2014, letn. 62, št. 2, str. 1-10. DOI: 10.2478/johh-2014-0013.

NOVAK, Gorazd, PENGAL, Polona, SILVA T., Ana, DOMINGUEZ, Jose Manuel, TAFUNI, Angel, ČETINA, Matjaž, ŽAGAR, Dušan. Interdisciplinary design of a fish ramp using migration routes analysis. *Ecological modelling*. [Print ed.]. jan. 2023, vol. 475, 12 str. DOI: 10.1016/j.ecolmodel.2022.110189.

NOVAK, Gorazd, DOMÍNGUEZ, José M., TAFUNI, Angel, ČETINA, Matjaž, ŽAGAR, Dušan. Določitev koeficienta upora potopljenega telesa z uporabo metode SPH = Evaluation of the drag coefficient of a fully submerged body using SPH. *Acta hydrotechnica*. [Spletna izd.]. 2019, letn. 32, št. 57, str. 107-119. DOI: 10.15292/acta.hydro.2019.08.

NOVAK, Gorazd, TAFUNI, Angel, DOMÍNGUEZ, José M., ČETINA, Matjaž, ŽAGAR, Dušan. A numerical study of fluid flow in a vertical slot fishway with the smoothed particle hydrodynamics method. *Water*. 2019, letn. 11, št. 9/1928, str. 1-23. DOI: 10.3390/w11091928.

JAŠAREVIĆ, Ajdin, HOČEVAR, Marko, RAK, Gašper. 2021. Turbulent flow height measurement with stereo vision. *Defense and security studies*, 2: 96-111. DOI: 10.37868/dss.v2.id175.

RAK, Gašper, STEINMAN, Franci, HOČEVAR, Marko, DULAR, Matevž, JEZERŠEK, Matija, PAVLOVČIČ, Urban. 2020. Laser ranging measurements of turbulent water surfaces. *European journal of mechanics. B, Fluids*, 81: 165-172. DOI: 10.1016/j.euromechflu.2020.02.001.

RAK, Gašper, HOČEVAR, Marko, STEINMAN, Franci. 2019. Water surface topology of supercritical junction flow. *Journal of Hydrology and Hydromechanics*, 67, (2): 163-170. DOI: 10.2478/johh-2018-0042.



## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                         |
|----------------------|-------------------------|
| <b>Predmet:</b>      |                         |
|                      | <b>RAČUNALNIŠTVO</b>    |
| <b>Course title:</b> |                         |
|                      | <b>COMPUTER SCIENCE</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 1. letnik | Letni    |

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| <b>Univerzitetna koda predmeta/University course code:</b> | 972 |
|------------------------------------------------------------|-----|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 15      | 0    | 15            | 0                    | 60              | 4    |

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| <b>Nosilec predmeta/Lecturer:</b> | Matevž Dolenc, Vlado Stankovski |
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| <b>Vrsta predmeta/Course type:</b> | Obvezni splošni/Obligatory general |
|------------------------------------|------------------------------------|

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| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

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| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b> |
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| <b>Vsebina:</b>                                                                                                                | <b>Content (Syllabus outline):</b>                                                                          |
| Osnove računalništva – razvoj računalništva, delovanje računalnikov, pravni in sociološki vidiki računalništva in informatike. | Introduction to computing – overview, history, legal / social and other views on computing and informatics. |
| Operacijski sistemi – pregled in delovanje operacijskih sistemov, virtualizacija.                                              | Operating systems – overview, modern desktop and mobile operating systems, virtualization ...               |
| Uporabniški programi – pregled računalniških programov (splošni programi, programi v inženirstvu ...).                         | End-user application – general and engineering applications.                                                |
|                                                                                                                                | Documents – standards, use of general purpose document based applications ...                               |

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| <p>Izdelava dokumentov – dokumentni standardi, osnovni koncepti, priprava daljših/zahtevnejših dokumentov.</p> <p>Računanje s preglednicami – osnovni koncepti, tabelarično računanje, uvoz podatkov, izdelava grafov, makro ukazi ...</p> <p>Podatkovni standardi – pregled podatkovnih standardov, sistemi za kodiranje znakov, uvod v XML ...</p> <p>Osnove programiranja – osnove razvoja preprostih inženirskih programov.</p> | <p>Computing with spreadsheets – overview, basic concepts, using built-in functions, using graphical presentation of data, import/export of data ...</p> <p>Data standards – overview of data standards, introduction to XML/JSON ...</p> <p>Introduction to programming – introduction to development of simple engineering applications.</p> |
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**Temeljna literatura in viri/Readings:**

Hunt A. and Thomas D. 1999. The Pragmatic Programmer: From Journeyman to Master. Addison Wesley. 321 str.

Frederick, P., Brooks. Jr. 1995. The Mythical Man Month and Other Essays on Software Engineering. Addison Wesley. 322 str.

Rogers Y., Sharp H., Preece J. 2011. Interaction Design: Beyond Human-Computer Interaction. John Wiley & Sons. 602 str.

Joyce, J., Moon, M. 2007. Sistem Microsoft Office 2007 hitro in jasno. Pasadena. 364 str.

Dolenc, M. <http://matevzdolenc.com>.

**Cilji in kompetence:**

- spoznati osnove računalništva, operacijskih sistemov in različnih uporabnih programov
- spoznati delo s preglednicami – osvojiti uporabo preglednic za razvoj rešitev preprostih inženirskih problemov
- spoznati osnovne podatkovne standarde
- spoznati osnove razvoja preprostih inženirskih programov

**Objectives and competences:**

- learn about basic computing concepts, operating systems, and general purpose applications
- engineering use of spreadsheet applications – use of spreadsheet applications in engineering
- learn about data standards
- development of simple engineering applications

**Predvideni študijski rezultati:**

- osnovno razumevanje računalništva in uporabo različnih računalniških tehnologij v inženirstvu
- poglobljeno znanje uporabe splošnih programov v inženirstvu
- uporaba preglednic za reševanje preprostih inženirskih nalog
- upravljanje s podatki, vizualizacija podatkov in rezultatov, uporaba vgrajenih funkcij

**Intended learning outcomes:**

- basic understanding of general computing subjects and understanding how different computing technologies can be applied in engineering
- use of general purpose application in providing solutions to engineering problems
- use of spreadsheet applications in engineering
- data management, graphical data visualization, use of built-in functions

|                                                        |                                                  |
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| - samostojna izdelava preprostih inženirskih programov | - development of simple engineering applications |
|--------------------------------------------------------|--------------------------------------------------|

**Metode poučevanja in učenja:****Learning and teaching methods:**

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| Predavanja, vaje, samostojno delo. | Lectures, tutorials, individual work. |
|------------------------------------|---------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                       |         |                          |
|-----------------------|---------|--------------------------|
| Pisni izpit (teorija) | 40,00 % | Written exam (theory)    |
| Seminarska naloga     | 30,00 % | Seminar work             |
| Pisni izpit (vaje)    | 30,00 % | Written exam (practical) |

**Reference nosilca/Lecturer's references:**

DOLENC, Matevž, KATRANUSCHKOV, Peter, GEHRE, Alexander, KUROWSKI, Krzysztof, TURK, Žiga. The IntelliGrid platform for virtual organisations interoperability. J. inf. tech. constr., 2007, vol. 12, str. 459-477. Dostopno na: [http://www.itcon.org/cgi-bin/works/Show?2007\\_30](http://www.itcon.org/cgi-bin/works/Show?2007_30).

KLINC, Robert, TURK, Žiga, DOLENC, Matevž. Engineering collaboration 2.0 : requirements and expectations. J. inf. tech. constr., 2009, letn. 14, pos. št., str. 473-488, ilustr. Dostopno na: <http://www.itcon.org/2009/31>.

PERUŠ, Iztok, KLINC, Robert, DOLENC, Matevž, DOLŠEK, Matjaž. A web-based methodology for the prediction of approximate IDA curves. Earthquake eng. struct. dyn.. [Print ed.], 2012, letn. 41, št. , str. 1-18, ilustr., doi: 10.1002/eqe.2192. ;

KÖNIG, Matija, DIRNBEEK, Jaka, STANKOVSKI, Vlado. Architecture of an open knowledge base for sustainable buildings based on Linked Data technologies. Autom. Constr.. [Print ed.], nov. 2013, letn. 35, str. 542-550, ilustr., doi: 10.1016/j.autcon.2013.07.002.

STANKOVSKI, Vlado, PETCU, Dana. Developing a Model Driven Approach for engineering applications based on mOSAIC : Towards sharing elastic components in the Cloud. Cluster comput., [v tisku] 2013, letn. XX, št. XX, str. 1-10, ilustr., doi: 10.1007/s10586-013-0263-x.

MARKIČ, Štefan, STANKOVSKI, Vlado. An equation-discovery approach to earthquake-ground-motion prediction. Eng. Appl. Artif. Intell.. [Print ed.], apr. 2013, letn. 26, št. 4, str. 1339-1347, ilustr., doi: 10.1016/j.engappai.2012.12.005.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                |
|----------------------|----------------|
| <b>Predmet:</b>      |                |
|                      | <b>STATIKA</b> |
| <b>Course title:</b> |                |
|                      | <b>STATICS</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 1. letnik | Letni    |

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|------------------------------------------------------------|-----|
| <b>Univerzitetna koda predmeta/University course code:</b> | 969 |
|------------------------------------------------------------|-----|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 60         | 0       | 60   | 0             | 0                    | 120             | 8    |

|                                   |              |
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| <b>Nosilec predmeta/Lecturer:</b> | Igor Planinc |
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| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni /Obligatory professional |
|------------------------------------|--------------------------------------------|

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|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

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| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b> |
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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Osnovni koncepti v teoriji konstrukcij: primeri gradbenih konstrukcij (stanovanjske in industrijske stavbe, pregrade, elektrarne, podzemne zgradbe ...); osnovni geometrijski modeli gradbenih konstrukcij (modeli podpor in vezi: členkasta, vpeta in drsna podpora, členkasta in drsna vez, linijske konstrukcije: nosilec, steber, vrv, okvir, brana in podobno, ploskovne konstrukcije: stene, plošče in lupine, prostorske konstrukcije); osnovne oblike obtežb gradbenih konstrukcij (lastna teža, veter, sneg, potres, temperatura, koristna obtežba, krčenje, posedanje temeljev, eksplozije, trki); model togega | Fundamental concepts and principles in structural mechanics: Short review of typical structures in civil engineering: residential and industrial buildings, dams, power plants, underground structures, etc.; fundamental models of the geometry of a structure: supports and kinematic pairs (fixed and hinged support, revolute and sliding joint), linear structural elements (rods, beams, truss, cables, ...), surface elements (walls, plates, shells ...), solid elements.<br><br>Fundamentals of structural load modelling: body and surface forces, dead and live loads, environmental loads (wind, temperature, seismic loads ...), creep, |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>in deformabilnega telesa; osnovne lastnosti gradbenih konstrukcij (togost, podajnost, duktilnost, stabilnost, statična določenost in nedoločenost konstrukcij); osnovni koncepti predpisov pri projektiranju gradbenih konstrukcij.</p> <p>Statika togega telesa: ravnotežni pogoji za sisteme sil z grafično interpretacijo; račun reakcij in sil v vezeh pri statično določenih linijskih konstrukcijah; ravnotežne enačbe za linijski nosilec, račun osnih in prečnih sil ter torzijskih in upogibnih momentov pri statično določenih linijskih konstrukcijah, pojem ovojnice, pojem vplivnice, določanje najneugodnejše lege obtežbe; opis in uporaba računalniških programov za statično analizo linijskih gradbenih konstrukcij.</p> | <p>foundation settlement, explosion, impacts. Rigid and deformable body models. Elementary properties of engineering structures: stiffness, flexibility, ductility, stability. Classification of statically determinate and indeterminate structures. Main concepts in structural design.</p> <p>Analysis of a rigid body: Force equilibrium requirement and its graphical interpretation. Free body diagrams. Force and moment reactions at the supports and connections of a statically determinate structure. Equilibrium equations of a rigid beam. Internal forces and moments in a frame. Envelopes and influence lines. Determination of the most unfavourable load position. Introduction to computer programs for the static analysis of frame-like structures.</p> |
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**Temeljna literatura in viri/Readings:**

Izbrana poglavja iz:

Stanek, M., Turk, G. 2005. Statika I : [univerzitetni učbenik]. 2. popravljena in dopolnjena izd.

Ljubljana: Fakulteta za gradbeništvo in geodezijo. VI, 329 str.

Stanek, M., Turk, G. 2008. Statika II. 2. popravljena in dopolnjena izd. Ljubljana: Fakulteta za gradbeništvo in geodezijo. 208 str.

Zupan, D. 2013. Statika : gradivo za vaje na študiju 1. stopnje Operativno gradbeništvo. Ljubljana:

Fakulteta za gradbeništvo in geodezijo. 1 optični disk (CD-ROM).

Saje, M., Zupan, D. 2013. NODI : odprtokodni program za nelinearno dinamično analizo ravninskih okvirjev: gradivo pri predmetih Kinematika in dinamika in Numerične metode v teoriji konstrukcij. Ljubljana: Fakulteta za gradbeništvo in geodezijo. 1 optični disk (CD-ROM).

**Cilji in kompetence:**

Cilji:

- spoznati osnovne oblike in lastnosti gradbenih konstrukcij,
- seznaniti se z osnovami modeliranja gradbenih konstrukcij,
- spoznati osnovne koncepte v mehaniki konstrukcij,
- poznavanje metod reševanja ravnotežnih enačb statično določenih linijskih konstrukcij z in brez uporabe računalniškega programa.

Predmetnospecifične kompetence:

- obvladovanje uporabe osnovnih ravnotežnih enačb statike togega telesa in sistema togih teles,

**Objectives and competences:**

Objectives:

- learn the elementary properties of engineering structures,
- develop an understanding of the principles of structural modelling,
- learn the fundamental concepts of structural mechanics,
- ability to analyze the equilibrium of statically determinate structures.

Competences:

|                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>- razumevanje, interpretacija in kritična presoja podatkov in rezultatov analiz, osnovnih metod reševanja preprostih statično določenih linijskih gradbenih konstrukcij,</li> <li>- uporablja računalniških programov pri analizi linijskih gradbenih konstrukcij.</li> </ul> | <ul style="list-style-type: none"> <li>- ability to formulate and solve equilibrium equations of a rigid body and a system of rigid bodies,</li> <li>- understanding, interpretation and critical evaluation of data and results of static analysis of statically determinate frames,</li> <li>- ability to use simple computer programs for structural analysis.</li> </ul> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Študent</b> <ul style="list-style-type: none"> <li>- bo sposoben razložiti osnovne lastnosti in modele gradbenih konstrukcij,</li> <li>- bo sposoben izračunati reakcije, sile v vezeh in notranje statične količine,</li> <li>- bo sposoben uporabiti ravnotežne enačbe sistema togih teles, osnovne metode reševanja ravnotežnih enačb za preproste sisteme togih teles (linijske gradbene konstrukcije),</li> <li>- bo sposoben aplicirati pridobljeno znanje na različnih problemih in pri uporabi različnih inženirskih računalniških programih,</li> <li>- bo sposoben kritično presojati rezultate analiz, dobljenih po različnih metodah.</li> </ul> | <b>Student</b> <ul style="list-style-type: none"> <li>- will be able to explain the basic properties and models of civil engineering structures,</li> <li>- will be able to explain reaction forces, joint forces and internal static forces,</li> <li>- will be able to use the equilibrium static equations for rigid-body systems, the basic solving methods for simple systems of rigid bodies (1D civil engineering structures),</li> <li>- will be able to apply the above-mentioned knowledge to different problems and in using different engineering computer programs,</li> <li>- will be able to critically assess the analytical results obtained by different methods.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                                                                                                                                                          |                                                                                                                                                           |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| Predavanja, seminarji, demonstracije, računalniško podprto učenje temelječe na modernih učnih metodah. Uporaba odprto-kodnih računalniških programov razvitih s strani nosilca predmeta. | Lectures, seminars, demonstrations, computer based learning employing modern methods.<br><br>Use of open-source program, developed by course coordinator. |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|             |         |                                   |
|-------------|---------|-----------------------------------|
| Pisni izpit | 40,00 % | Final exam, practical part        |
| Ustni izpit | 40,00 % | Final oral exam, theoretical part |
| 2 kolokvija | 30,00 % | 2 midterm exams                   |

**Reference nosilca/Lecturer's references:**

HOZJAN, Tomaž, SAJE, Miran, SRPČIČ, Stane, PLANINC, Igor. Geometrically and materially non-linear analysis of planar composite structures with an interlayer slip. Comput. struct.. [Print ed.], jan. 2013, letn. 114-115, str. 1-17, ilustr., doi: 10.1016/j.compstruc.2012.09.012.

HOZJAN, Tomaž, SAJE, Miran, SRPČIČ, Stane, PLANINC, Igor. Geometrically and materially non-linear analysis of planar composite structures with an interlayer slip. Comput. struct.. [Print ed.], jan. 2013, letn. 114-115, str. 1-17, ilustr., doi: 10.1016/j.compstruc.2012.09.012.

MARKOVIČ, Mojca, KRAUBERGER, Nana, SAJE, Miran, PLANINC, Igor, BRATINA, Sebastjan. Non-linear analysis of pre-tensioned concrete planar beams. Eng. struct.. [Print ed.], jan. 2013, letn. 46, str. 279-293, ilustr., doi: 10.1016/j.engstruct.2012.08.004

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                   |
|----------------------|-----------------------------------|
| <b>Predmet:</b>      |                                   |
|                      | <b>INŽENIRSKA MATEMATIKA II</b>   |
| <b>Course title:</b> |                                   |
|                      | <b>ENGINEERING MATHEMATICS II</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 2. letnik | Zimski   |

|                                                            |     |
|------------------------------------------------------------|-----|
| <b>Univerzitetna koda predmeta/University course code:</b> | 997 |
|------------------------------------------------------------|-----|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 45         | 0       | 30   | 0             | 0                    | 75              | 5    |

|                                   |                                      |
|-----------------------------------|--------------------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Marjeta Kramar Fijavž, Gašper Jaklič |
|-----------------------------------|--------------------------------------|

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| <b>Vrsta predmeta/Course type:</b> | Obvezni splošni/Obligatory general |
|------------------------------------|------------------------------------|

|                          |                      |             |
|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>         | <b>Prerequisites:</b>                                                        |
|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| K izpitu lahko pristopi, kdor ima opravljen izpit iz vsebin Inženirske matematike I. | Passed exam in Engineering mathematics I or courses with comparable content. |

| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Riemannov integral funkcije ene spremenljivke: primitivna funkcija, integracijske metode (integracija po delih, uvedba nove spremenljivke v določeni in nedoločeni integral), uporaba.</p> <ul style="list-style-type: none"> <li>- Funkcije več realnih spremenljivk: zveznost, parcialni odvod, gradient, verižno pravilo, totalni diferencial, ekstremi - lokalni, globalni.</li> <li>- Dvojni Riemannov integral: definicija, lastnosti, izračun, uvedba novih spremenljivk, uporaba.</li> </ul> | <p>Riemann integral of functions of one real variable, primitive function, integration methods, applications.</p> <ul style="list-style-type: none"> <li>- Functions of several real variables: continuity, partial derivative, gradient, chain rule, total differential, extrema – local, global.</li> <li>- Double Riemann integral: definition, properties, computation, applications.</li> </ul> |



- Navadne diferencialne enačbe: rešitev, začetni problem, linearna diferencialna enačba.

- Ordinary differential equations: solution, initial value problem, linear differential equation.

### Temeljna literatura in viri/Readings:

Izbrana poglavja iz:

Vidav, I. 1981. Višja matematika II. Ljubljana, DZS, DMFA založništvo, str. 299-314.

Elliott Mendelson, Frank Ayres, Schaum's. 1999. Outline of Calculus. McGraw-Hill, str. 206-288, 442-463, 511-519.

Mizori - Oblak, P. 2001. Matematika za študente tehnike in naravoslovja I, II (zbirka nalog). Fakulteta za strojništvo, Ljubljana, str. 65-198, 200-205.

### Cilji in kompetence:

Cilji:

- osnovna znanja, na katerih lahko grade strokovni predmeti,
- obvladovanje računskih veščin,
- sposobnost kritične presoje podatkov in dobljenih računskih rezultatov,
- zna v praksi uporabiti različne matematične metode.

Predmetnospecifične kompetence:

- pozna in razume matematična orodja,
- je sposoben kritične presoje podatkov in dobljenih računskih rezultatov,
- je sposoben uporabiti različne matematične metode v strokovni praksi.

### Objectives and competences:

Objectives:

- basic knowledge for engineering courses,
- managing of basic computational skills,
- to develop critical judgement of data and obtained numerical results,
- to be able to apply various mathematical methods.

Competences:

- knowledge and understanding of basic mathematical tools,
- ability of critical judgement of data and obtained numerical results,
- capability of application of various mathematical methods in engineering.

### Predvideni študijski rezultati:

- Poznavanje in razumevanje osnovnih znanj iz matematične analize,
- obvladovanje osnovnih računskih veščin,
- uporaba matematičnih orodij pri formulaciji in reševanju problemov,
- uporaba znanja matematike pri strokovnih predmetih,
- razumevanje matematičnih orodij na podlagi uporabe,

### Intended learning outcomes:

- Basic knowledge and understanding of mathematical analysis,
- mastering of basic computational skills,
- ability to use mathematical tools in formulation and solving of problems,
- using mathematical knowledge in engineering courses,
- applications basing understanding of mathematical tools,

|                                                                           |                                                                         |
|---------------------------------------------------------------------------|-------------------------------------------------------------------------|
| - sposobnost kritične presoje podatkov in dobljenih računskih rezultatov, | - ability of critical judgement of data and obtained numerical results, |
| - spretnost sistematičnega, jasnega in preciznega formuliranja problemov, | - capability of systematic, clear and precise formulation of problems,  |
| - spretnost uporabe literature.                                           | - skills in using literature.                                           |

**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                             |                                |
|---------------------------------------------|--------------------------------|
| Predavanja, seminarske vaje, domače naloge. | Lectures, tutorials, homework. |
|---------------------------------------------|--------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                        |         |                         |
|------------------------|---------|-------------------------|
| Naloge in sprotno delo | 70,00 % | Exercises and homework  |
| Izpit (teoretičen del) | 30,00 % | Exam (theoretical part) |

**Reference nosilca/Lecturer's references:**

ENGEL, Klaus, KRAMAR FIJAVŽ, Marjeta, KLÖSS, Bernd, NAGEL, Rainer, SIKOLYA, Eszter. Maximal controllability for boundary control problems. Appl. math. optim., 2010, vol. 62, no. 2, str. 205-227.

KRAMAR FIJAVŽ, Marjeta, MUGNOLO, Delio, SIKOLYA, Eszter. Variational and semigroup methods for waves and diffusion in networks. Appl. math. optim., 2007, vol. 55, no. 2, str. 219-240.

KRAMAR FIJAVŽ, Marjeta, SIKOLYA, Eszter. Spectral properties and asymptotic periodicity of flows and networks. Math. Z., 2005, vol. 249, no. 1, str. 139-162. Dostopno na:

<http://springerlink.metapress.com/app/home/issue.asp?wasp=9ed0dca63b2b46c3ad74b3d0e2855bcc&referrer=parent&backto=journal,5,116;linkingpublicationresults,1:100443,1> .

KRAMAR FIJAVŽ, Marjeta. The structure of irreducible matrix groups with submultiplicative spectrum. Linear multilinear algebra, 2005, vol. 53, no. 1, str. 13-25.

JAKLIČ, Gašper, KOZAK, J., KRAJNC, M., VITRIH, V., ŽAGAR, E. High-order parametric polynomial approximation of conic sections, Constructive Approximation, Volume 38, Issue 1 (2013), 1--18.

JAKLIČ, Gašper, KOZAK, J., KRAJNC, M., VITRIH, V., ŽAGAR, E. Hermite geometric interpolation by rational Bezier spatial curves, SIAM Journal on Numerical Analysis, Vol. 50, No. 5, 2012, pp. 2695--2715.

JAKLIČ, Gašper, ŽAGAR, E. Planar cubic G1 interpolatory splines with small strain energy, Journal of Computational and Applied Mathematics, 235 (2011), 2758--2765.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                       |
|----------------------|---------------------------------------|
| <b>Predmet:</b>      |                                       |
|                      | <b>OSNOVE MEHANIKE TAL</b>            |
| <b>Course title:</b> |                                       |
|                      | <b>FUNDAMENTALS OF SOIL MECHANICS</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 2. letnik | Zimski   |

|                                                            |     |
|------------------------------------------------------------|-----|
| <b>Univerzitetna koda predmeta/University course code:</b> | 998 |
|------------------------------------------------------------|-----|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 45         | 0       | 0    | 25            | 5                    | 75              | 5    |

|                                   |                               |
|-----------------------------------|-------------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Matej Maček, Vladimir Vukadin |
|-----------------------------------|-------------------------------|

|                                    |                                           |
|------------------------------------|-------------------------------------------|
| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni/Obligatory professional |
|------------------------------------|-------------------------------------------|

|                          |                      |             |
|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

|                                                                              |                                                                                             |
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| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b>                                                                       |
| Opravljen izpit iz predmetov Inženirska matematika I, Gradiva in Fizika.     | Passed exams in Engineering mathematics I, Physics and Construction and building materials. |

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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Pomen geologije v gradbeništvu; zgradba zemlje, tektonika plošč, endogeni in eksogeni procesi, osnove geološke karte in geoloških profilov; kamnine: razdelitev kamnin po nastanku, mineralna sestava kamnin, klasifikacija kamnin v gradbeništvu, kamnine na slovenskem ozemlju; geološka starost, tektonska dogajanja, geološka okolja, pomembna za gradbeništvo; osnove hidrogeologije; pobočni procesi; IG lastnosti kamnin in kamninske mase in načini preiskovanja; geološke raziskave za potrebe gradbeništva; osnovne fizikalne in mehanske | Role of geology in civil engineering; earth structure, plate tectonics, endogenous and exogenous processes, the basics of geological maps and geological profiles; classification of rocks based on origin, minerals and mineral composition of rocks, rock mass classification/ classification of rocks in civil engineering, rocks of the Slovene territory; the geological time scale, tectonic events, geological environments important for civil engineering; basics of hydrogeology; slope processes; rock properties and their determination; geological investigation ; |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                          |
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| lastnosti zemljin, zemljina kot trifazni sistem, osnovne laboratorijske preiskave zemljin; klasifikacija zemljin; standardi v geotehnikih; prvotne in dodatne napetosti v tleh; voda v tleh, pojem pornega tlaka, efektivnih in totalnih napetosti, strujanje vode; konsolidacija tal; dodatne napetosti v tleh pod temelji enostavnih oblik, računanje posedkov tal pod obtežbami enostavnih oblik po metodi ploščine diagrama dodatnih napetosti in z uporabo edometriškega modula stisljivosti; račun časovnega razvoja posedkov (konsolidacije). | basic physical and mechanical properties of soils, laboratory soil tests; classification of soils; standards in geotechnical engineering; stresses in the soil; water in the soil, the concept of pore pressure, effective and total stresses, ground water flow and seepage forces; ground deformations and settlements; consolidation. |
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**Temeljna literatura in viri/Readings:**

Ribičič, M. 2002. Inženirska geologija I, skripta. Ljubljana, UL FNT.

Ribičič, M. 2002. Inženirska geologija II, skripta. Ljubljana, UL FNT.

Waltham, T. 2009. Foundations of engineering geology, CRC press

Šuklje, L. 1984. Mehanika tal. Ljubljana, Univerza v Ljubljani, Fakulteta za arhitekturo, gradbeništvo in geodezijo, str. 1-197 in 212-268.

Nonveiller, E. 1990. Mehanika tla i temeljenje građevina. Zagreb, Školska knjiga, str. 13-309 in 401-455.

Učno gradivo v spletni učilnici UL FGG.

Skripta za predmet Inženirska geologija. Ljubljana, in Majes, B. 2006. Skripta za predmet Mehanika tal. Ljubljana.

**Cilji in kompetence:**

Cilji:

- spoznati osnove geologije z namenom razumevanja sestave tal in procesov na površini in globoko v litosferi,
- spoznati osnovne kamnine, bistvene fizikalne lastnosti kamnin, osnove tektonike in inženirske geologije s hidrogeologijo,
- osvojiti osnove mehanike tal in razumeti bistvene posebnosti v primerjavi z ostalimi področji gradbeništva (odvisnost od preiskav tal, večfaznost in nelinearnost zemljin, 3D prostor).

Predmetnospecifične kompetence:

- sposobnost komunikacije med gradbenikom in geologom,
- izvedba preprostih laboratorijskih preiskav,
- razumevanje preprostih geološko geotehničnih poročil o preiskavah tal,

**Objectives and competences:**

Objectives:

- to understand the basics of geology in order to understand the ground structure and processes on the surface,
- to learn the basics of mineralogy and petrology, fundamental physical properties of rocks, basics of tectonics and geology engineering, hydrogeology,
- to assimilate the basics of soil mechanics and to understand the essential peculiarities of geotechnical engineering in comparison to other areas of civil engineering (dependence on ground investigations, multi-phase and non-linearity of soils, 3D space).

Competences:

- ability to communicate with geologist,
- conducting of simple rock and soil laboratory tests,
- understanding of simple geotechnical reports based on ground investigations,

|                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                    |
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| <ul style="list-style-type: none"> <li>- izračuni prvotnih napetosti v tleh, dodatnih napetosti zaradi obtežbe z enostavnimi objekti,</li> <li>- izračuni posedkov pod preprostimi objekti in nasipi, izračuni časovnega razvoja posedkov,</li> <li>- sposobnost razumevanja in kritične presoje rezultatov.</li> </ul> | <ul style="list-style-type: none"> <li>- calculations of stresses and settlements of the ground under engineering structures and embankments, calculations of ground consolidation,</li> <li>- ability to understand and critically assess the results.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

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| <ul style="list-style-type: none"> <li>- prepoznavanje zemljin in kamnin, pomembnih za slovenski prostor in opisovanje njihovih osnovnih lastnosti, terminologija, osnovni pojmi geologije, postopki preskušanja vzorcev zemljin v laboratoriju in na terenu</li> <li>- razumevanje nastanka zemeljskega površja, erozijskih procesov, odnosa med starostjo kamnin, tektoniko, mineralogijo ter lastnostmi kamnin in kamninske mase, razumevanje bistvenih osnovnih pojmov mehanike tal (napetosti v tleh – totalne, efektivne, porne tlaki; konsolidacija, togost, ), razumevanje pomena preiskav tal v gradbeništvu</li> <li>- komunikacija med gradbeniki in geologi</li> <li>- osnovno klasificiranje zemljin in kamnin, prepoznavanje eksogenih procesov s poudarki na pobočnih procesih in erozijskih pojavih, izvedba osnovnih laboratorijskih preiskav tal, sposobnost razumevanja geotehniške dokumentacije</li> <li>- uporaba enačb in postopkov za računske analize napetosti v tleh, posedkov, trajanja konsolidacije in enostavni primeri toka vode v tleh</li> </ul> | <ul style="list-style-type: none"> <li>- identification/recognition of soils and rocks important for the Slovene territory, and their basic engineering properties, terminology, basic concepts of geology, laboratory and field/in-situ testing of soil and rocks</li> <li>- understandings of formation of the Earth's surface, erosion processes, relationship between the age of rocks, tectonics, mineralogy and properties of geo-materials, basic concepts of soil mechanics (stresses in soil, total and effective stress, pore pressure, consolidation, stiffness, shear strength, slope stability), importance of ground investigations in civil engineering</li> <li>- communication between civil engineer and Geologists</li> <li>- basic classification of soils and rocks, identification of erosion phenomena, conducting basic laboratory tests in/on soils, ability to understand geotechnical documentation</li> <li>- use of equations and computational procedures for the analysis of stresses in soil, ground settlements and time of consolidation</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                              |                                                |
|----------------------------------------------|------------------------------------------------|
| Predavanja, laboratorijske in terenske vaje. | Lectures, laboratory exercises and field work. |
|----------------------------------------------|------------------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                        |         |                                               |
|------------------------|---------|-----------------------------------------------|
| Pisno - računski del   | 50,00 % | Written exam - computational part (exercises) |
| Pisno - teoretični del | 50,00 % | Written exam - theory                         |

**Reference nosilca/Lecturer's references:**

MAČEK, Matej, SMOLAR, Jasna, PETKOVŠEK, Ana (2019) The reliability of CPTu and DMT for the mechanical characterisation of soft tailings. Bulletin of engineering geology and the environment 78(4): 2237-2252.

MAČEK, Matej, SMOLAR, Jasna, PETKOVŠEK, Ana (2018) Klasifikacija zemljin za inženirske namene v Sloveniji - kako naprej? *Geologija* 61(1): 33-48.

VUKADIN, Vladimir, JOVIČIĆ, Vojkan (2018) S\_BRICK : a constitutive model for soils and soft rocks. *Acta geotechnica Slovenica* 15(2): 16-37.

FABJAN, Teja, MAS IVARS, Diego, VUKADIN, Vladimir (2015) Numerical simulation of intact rock behaviour via the continuum and Voronoi tessellation models : a sensitivity analysis. *Acta geotechnica Slovenica* 12(2): 4-23.

VUKADIN, Vladimir (2013) The improvement of the loosely deposited sands and silts with the Rapid Impact Compaction technique on Brežice test sites. *Engineering geology* 160: 69-80.

MAČEK, Matej, MAJES, Bojan, PETKOVŠEK, Ana (2011) Influence of mould suction on the volume - change behaviour of compacted soils during inundation. *Acta geotechnica Slovenica*. 8(2): 67-79.

UČNI NAČRT PREDMETA/COURSE SYLLABUS

|               |                                           |
|---------------|-------------------------------------------|
| Predmet:      |                                           |
|               | <b>POVRŠINSKA ODVODNJA (KANALIZACIJA)</b> |
| Course title: |                                           |
|               | <b>SURFACE DRAINAGE (URBAN DRAINAGE)</b>  |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 2. letnik | Zimski   |

|                                                     |     |
|-----------------------------------------------------|-----|
| Univerzitetna koda predmeta/University course code: | 999 |
|-----------------------------------------------------|-----|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 15      | 15   | 0             | 0                    | 60              | 4    |

|                            |                           |
|----------------------------|---------------------------|
| Nosilec predmeta/Lecturer: | Mario Krzyk, Simon Rusjan |
|----------------------------|---------------------------|

|                             |                                           |
|-----------------------------|-------------------------------------------|
| Vrsta predmeta/Course type: | Obvezni strokovni/Obligatory professional |
|-----------------------------|-------------------------------------------|

|                   |                      |             |
|-------------------|----------------------|-------------|
| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|                   | Vaje/Tutorial:       | Slovenščina |

| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
|-----------------------------------------------------------------------|----------------|
|                                                                       |                |

| Vsebina:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Content (Syllabus outline):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| <p>Padavine in odtok; odtok površinskih voda; vodna bilanca. Osnovne analize hidroloških podatkov za načrtovanje odvodnje; vplivi spremenjene rabe tal in grajenega okolja na odtočne razmere. Koincidenca pojavov visokih voda v recipientih in sistemih odvodnje.</p> <p>Zasnova sistemov za odvodnjo onesnaženih voda; objekti na sistemih za odvodnjo; dimenzioniranje in vzdrževanje sistemov, objektov in naprav za odvodnjo. Visoke vode; protipoplavni ukrepi in protipoplavna gradnja objektov na urbaniziranih</p> | <p>Precipitation and runoff; runoff of surface waters; water balance. Basic analysis of hydrological data for drainage design; the impact of change land use and build environment on runoff formation. Coincidence of high water events in recipients and drainage systems.</p> <p>Design of systems for drainage of sewage water; facilities on drainage systems; design and maintenance of systems, facilities, and equipment for surface drainage. High water; flood protection measures urbanized areas; floodproofing of buildings; appropriate assessment of flood safety of</p> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>površinah; presoja varnosti urbaniziranih površin pred lastnimi in zalednimi padavinskimi vodami.</p> <p>Zajem in odvajanje zalednih voda: dimenzioniranje in izvedba drenaž; obvladovanje površinskih padavinskih voda: dimenzioniranje in izvedba (obcestni jarki; kanalete; prepusti); protierozijska zaščita površin (ob cestah, ob manjših vodotokih; na gradbiščih).</p> <p>Načrtovanje trajnostnih (sonaravnih rešitev) za zmanjšanje količin in onesnaženja lastnega površinskega padavinskega odtoka: zadrževanje in razbremenjevanje voda s pomočjo sonaravnih rešitev (RČN), objekti in površine za zadrževanje in ponikanje padavinskega odtoka (drenažni betoni za tlakovane površine), modro-zelena infrastruktura, objekti za trajnostno upravljanje s padavinskim odtokom (objekti za kontrolo količin in zmanjševanje onesnaženja površinskega padavinskega odtoka). Možnosti ponovne uporabe padavinske vode v kontekstu krožnega gospodarstva.</p> <p>Osnove spremljanja stanja (monitoring) elementov infrastrukture za urbano odvodnjo.</p> | <p>urbanized areas against their own back-waters and stormwaters.</p> <p>Capturing and drainage of back-water: design and implementation of drainage facilities; management of surface stormwater runoff: design and execution (roadside ditches, channels, culverts); erosion protection (roadsides, small watercourses, construction sites).</p> <p>Designing sustainable (nature-based) solutions to reduce the amount and pollution of surface stormwater runoff: retention and relief of water by implementing sustainable solutions (sustainable wastewater treatment plants), facilities, and surfaces for retention and percolation of stormwater runoff (pervious concrete for paved surfaces), blue-green infrastructure, facilities for sustainable management of stormwater runoff (facilities for volume control and reduction of surface stormwater runoff pollution). Rainwater reuse in the context of the circular economy.</p> <p>Basic monitoring procedures of urban drainage components.</p> |
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#### Temeljna literatura in viri/Readings:

- Brilly, M., Mikoš, M., Šraj, M. 1999. Vodne ujme – varstvo pred poplavami, erozijo in plazovi – univerzitetni učbenik. UL FGG, 186 str.
- Brilly, M., Šraj, M. 2005. Osnove hidrologije – univerzitetni učbenik. UL FGG, 309 str. (pogl.10 "Odtok površinskih voda" str. 156-176; pogl.12 "Vodna bilanca" str. 204-217).
- Mays, L. W. (2010). Water resources engineering. John Wiley & Sons. 365-477.
- Panjan, J. 1999. Odvodnjavanje onesnaženih voda – skripta. UL FGG, 103 str.
- Panjan, J. 2005. Osnove zdravstveno hidrotehnične infrastrukture, UL FGG, 289 str.
- Krzyk, M. 2022. Komunalne naprave. 2. del : študijsko gradivo za študente univerzitetnega študija "Vodarstvo in okoljsko inženirstvo". Ljubljana: Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo.
- Woods-Ballard, B., Kellagher, R., Martin, P., Jefferies, C., Bray, R., & Shaffer, P. (2007). The SUDS manual (Vol. 697). London: Ciria. 599 str.
- Raseswari, P. and Jayaprakash, S. Smart Rainwater Management: New Technologies and Innovation, IntechOpen, 2023, DOI: <http://dx.doi.org/10.5772/intechopen.86336>.
- Standard DWA-A 138E (2005): Planning, Construction, and Operation of Facilities for the Percolation of Precipitation Water.
- Standard DWA-M 153 (2007): Action for Dealing Stormwater.

#### Cilji in kompetence:

#### Objectives and competences:



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| <p><b>Cilji:</b></p> <ul style="list-style-type: none"> <li>- osvojitev osnov inženirske hidrologije ter različnih načinov odvodnjavanja površin v grajenem okolju (mestne površine, avtoceste, prometnice, odvodnjavanje objektov in njihovih funkcionalnih površin) in v naravni krajini (ukrepi za obvladovanje poplavnih in zalednih voda).</li> </ul> <p><b>Predmetnospecifične kompetence:</b></p> <ul style="list-style-type: none"> <li>- razumevanje teoretičnega ozadja praktičnega reševanja s poudarkom na različnosti in posebnostih posameznih ukrepov odvodnjavanja, načrtovanja gradbenih in negradbenih protipoplavnih ukrepov ter protipoplavne gradnje,</li> <li>- obvladovanje umestitve manj zahtevnih sistemov in objektov odvodnjavanja v prostor,</li> <li>- obvladovanje dimenzioniranja manj zahtevnih sistemov po enostavnejših metodah,</li> <li>- sposobnost ocenjevanja stabilnosti manj zahtevnih sistemov pri vgrajevanju, njihovo statično obremenjenost in oceno proti porušitvi,</li> <li>- poznavanja in razumevanja kontrole vodotesnosti pri kanalskih sistemih,</li> <li>- razumevanje sodobnih pristopov k trajnostnemu upravljanju s padavinskim odtokom z načrtovanjem modro-zelene infrastrukture in pristopov k trajnostnemu načrtovanju in gradnji stavb,</li> <li>- sposobnost modeliranja in vrednotenja učinka modro-zelene infrastrukture in kritične presoje primernosti modro-zelene infrastrukture v danih pogojih,</li> <li>- razumevanje učinkov podnebnih sprememb na sistem urbane odvodnje in prilagajanje nanje,</li> <li>- razumevanje osnovnih elementov upravljanja s tveganji pri izvajanju urbane odvodnje.</li> </ul> | <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>- to acquire basic knowledge of engineering hydrology and different modes of surface drainage in the built environment (urban area, highways, roads, drainage of buildings and their functional surfaces) and in the natural landscape (measures for controlling floods and back-waters).</li> </ul> <p><b>Competences:</b></p> <ul style="list-style-type: none"> <li>- understanding of the theoretical background of practical problem solving with an emphasis on diversity and specifics of individual drainage solutions, designing structural and non-structural flood protection measures and flood control works,</li> <li>- placement of less demanding systems and drainage facilities in the landscape,</li> <li>- designing less demanding systems according to simpler methods,</li> <li>- the ability to assess the stability of less complex systems at construction, their static workload, and assessment against breakage,</li> <li>- knowledge and understanding of waterproof control of canal systems,</li> <li>- understanding modern approaches to sustainable management of stormwater runoff by designing blue-green infrastructure and sustainable design and construction of buildings,</li> <li>- the ability to model and evaluate the effects of blue-green infrastructure and critical assessment of the suitability of blue-green infrastructure in specific conditions,</li> <li>- understanding and adapting to the impacts of climate change on urban drainage systems,</li> <li>- understanding basic risk management in urban drainage.</li> </ul> |
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**Predvideni študijski rezultati:**

Študent bo sposoben:

- uporabiti znanje iz osnov hidrologije, hidravlike, in kakovostnih značilnosti voda urbanega okolja pri izboru ustreznega načina površinske odvodnje raznih objektov in inženirskih gradenj ter načina protipoplavne gradnje objektov,

**Intended learning outcomes:**

Student will be able to:

- use basic knowledge of hydrology, hydraulics, and water quality characteristics of the built environment in the selection of the appropriate method of surface drainage structures, various engineering constructions, and construction methods of flood control facilities,

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| <ul style="list-style-type: none"> <li>- uporabiti pridobljeno znanje na naslednjih področjih: zasnova, načrtovanje, izvajanje in vzdrževanje enostavnih objektov za površinsko odvodnjavanje; zasnova, načrtovanje in izvajanje protipoplavne gradnje objektov,</li> <li>- načrtovati posamezne enostavnejše klasične objekte in dele sistemov za trajnostno upravljanje s padavinskim odtokom,</li> <li>- razumeti proces oblikovanja trajnostnih rešitev ob upoštevanju tveganj zaradi dinamičnega okolja in podnebnih sprememb.</li> </ul> | <ul style="list-style-type: none"> <li>- use this knowledge in the following areas: design, planning, implementation, and maintenance of simple facilities for surface drainage; design, planning, and implementation of flood protection measures for buildings,</li> <li>- design traditional facilities and parts of the systems for sustainable management of stormwater runoff,</li> <li>- understand the design process of sustainable solutions, taking into account the risks due to the dynamic environment and climate change.</li> </ul> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                          |
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| <p>Predavanja, terenske (na objektih modro-zelene infrastrukture) in računske vaje s praktičnimi računskimi primeri iz prakse. Izdelava individualne seminarske naloge na izbrano temo z zagovorom.</p> <p>Demonstracija na učnem poligonu sistema urbane odvodnje s prikazom zajema in digitalne analize podatkov.</p> | <p>Lectures, field tutorials (on facilities of blue-green infrastructure), and classroom tutorials with practical calculation examples. Preparing and defending individual seminar paper on a chosen topic.</p> <p>Demonstration of the learning polygon for urban drainage with the demonstration of data acquisition and analysis.</p> |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                     |         |                          |
|---------------------|---------|--------------------------|
| Pisni izpiti        | 50,00 % | Written exams            |
| Sprotno delo – vaje | 25,00 % | Ongoing work - exercises |
| Seminar             | 25,00 % | Seminar                  |

**Reference nosilca/Lecturer's references:**

KRZYK, Mario, MALUS, Davor, PANJAN, Jože. Meritve kakovostnih parametrov za modeliranje prvega vala onesnaženih voda s cestnih površin = Measurements of quality parameters for the modeling of the first flush of polluted water from roads. Gradbeni vestnik, ISSN 0017-2774, jul. 2013, letn. 62, str. 159-164.

KRZYK, Mario, DREV, Darko, KOLBL REPINC, Sabina, PANJAN, Jože. Self-purification processes of Lake Cerknica as a combination of wetland and SBR reactor. Environmental science and pollution research, ISSN 0944-1344. [Print ed.], dec. 2015, letn. 22, št. 24, str. 20177-20185.

DREV, Darko, KRZYK, Mario. Raziskava pomanjkljivosti Zakona o varstvu okolja in njegovih podzakonskih aktov z vidika načrtovanja in gradnje objektov = Investigation of the deficiencies of the environmental protection act and its regulations in terms of building design and construction. Gradbeni vestnik : glasilo Zveze društev gradbenih inženirjev in tehnikov Slovenije, ISSN 0017-2774. [Tiskana izd.], mar. 2021, letn. 70, str. 51-58.

KRZYK, Mario, DREV, Darko. Incompatibility of Slovenian regulations in the field of water management with European regulations and resulting damage. Lexonomica: revija za pravo in ekonomijo, ISSN 1855-7147. [Tiskana izd.], dec. 2021, vol. 13, no. 2, str. 167-186.

BEZAK, Nejc, KOVAČEVIĆ, Martina, JOHNEN, Gregor, LEBAR, Klaudija, ZUPANC, Vesna, VIDMAR, Andrej, RUSJAN, Simon. Exploring options for flood risk management with special focus on retention reservoirs. Sustainability, ISSN 2071-1050, 2021, letn. 13, št. 18, 10099, [20] str.

KRYŽANOWSKI, Andrej, BRILLY, Mitja, RUSJAN, Simon, SCHNABL, Simon. Structural flood-protection measures referring to several European case studies: review article. Natural hazards and earth system sciences, ISSN 1561-8633, jan. 2014, letn. 14, str. 135-142, ilustr.

RUSJAN, Simon, MIKOŠ, Matjaž, BEZAK, Nejc. Vodna erozija v porečju Gradaščice = Water erosion in the Gradaščica river catchment. Ujma: revija za vprašanja varstva pred naravnimi in drugimi nesrečami, ISSN 0353-085X, 2015, št. 29, str. 79-84.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                         |
|----------------------|-----------------------------------------|
| <b>Predmet:</b>      |                                         |
|                      | <b>PROJEKTIRANJE IN GRADNJA CEST</b>    |
| <b>Course title:</b> |                                         |
|                      | <b>DESIGN AND CONSTRUCTION OF ROADS</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 2. letnik | Zimski   |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1005 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 45         | 0       | 0    | 45            | 0                    | 90              | 6    |

|                                   |             |
|-----------------------------------|-------------|
| <b>Nosilec predmeta/Lecturer:</b> | Peter Lipar |
|-----------------------------------|-------------|

|                                    |                                           |
|------------------------------------|-------------------------------------------|
| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni/Obligatory professional |
|------------------------------------|-------------------------------------------|

|                          |                      |             |
|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

|                                                                              |                       |
|------------------------------------------------------------------------------|-----------------------|
| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b> |
|                                                                              |                       |

|                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                            | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                     |
| Prometna politika; planiranje in okolje; razdelitev cest; projektna dokumentacija; določitev prečnega prereza; horizontalni potek osi; vertikalni potek osi; prostorsko vodenje; preglednost; trenje; razširitve; odvodnjevanje; dimenzioniranje zgornjega ustroja; objekti; vrste križišč; kolesarski površine; peš površine; umirjanje prometa; mirujoči promet; prometna signalizacija. | Transport policy; planning and environment; Road classification; project documentation; cross-section of the road; horizontal leading of road axis; vertical leading of road axis; space interaction of the road Sight field; friction; widening of the road; water management; surfacing; road objects; intersections; bicycle infrastructure; pedestrian infrastructure; traffic calming; parking facilities; traffic signalization. |

**Temeljna literatura in viri/Readings:**

Juvanc A. 2004. Temeljni pogoji za določanje cestnih elementov. Ljubljana, Interno gradivo UL FGG – PTI, 55 str.

Juvanc A. 2004. Geometrijski elementi ceste in vozišča. Ljubljana, Interno gradivo UL FGG – PTI, 67 str.

Različni tehnični predpisi za projektiranje cest (domači in tuji).

**Cilji in kompetence:****Cilji:**

- seznaniti s transportnimi sistemi in s stvarnimi in predpisanimi pogoji za načrtovanje cest in spremljajočih ureditev ter tehničnimi rešitvami.

**Predmetnospecifične kompetence:**

- sposobnost za samostojno izdelavo enostavnega projekta za cesto,
- pridobitev sposobnosti za sodelovanje pri gospodarjenju s cestami in za skupinsko delo,
- razumevanje metod in postopkov pri načrtovanju, projektiranju in gradnji.

**Objectives and competences:****Objectives:**

- to be aware of the transport systems and prescribed conditions for road design and related arrangements and technical solutions.

**Competences:**

- ability to independently produce a simple project of a road,
- gaining the ability to participate in the management of roads and teamwork,
- understanding the methods and procedures for planning, design and construction of roads.

**Predvideni študijski rezultati:**

- poznavanje prometnih sistemov
- poznavanje voznodinamičnih zakonitosti in sistema VOZNIK-VOZILO-OKOLJE in elementov ceste in način njihovega usklajevanja
- razumevanje metod in postopkov pri načrtovanju, projektiranju in gradnji cest
- sposobnost samostojnega sprejemanja odločitev, kritične presoje variantnih rešitev in sodelovanja v delovnem timu

**Intended learning outcomes:**

- knowledge and understanding of traffic systems
- knowledge of laws of driving dynamics and system DRIVER-VEHICLE-ENVIRONMENT and road elements and how to co-ordinate them
- understanding of the methods and procedures for planning, design and construction of roads
- ability of independent decision-making, critical assessment of alternative solutions and participation in a team

**Metode poučevanja in učenja:**

Predavanja in uporaba pridobljenih znanj pri vajah in projektnem izdelku.

**Learning and teaching methods:**

Lectures and application of acquired knowledge to tutorials and project product.

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                          |         |                                   |
|--------------------------|---------|-----------------------------------|
| Pisni in/ali ustni izpit | 50,00 % | Written and / or oral examination |
| Vaje/projektne izdelke   | 50,00 % | Practical work - design           |

**Reference nosilca/Lecturer's references:**

KOSTANJŠEK, Jure, LIPAR, Peter. »Survey on the effectiveness of traffic calming measures.« V: ROTIM, Franko (ur.). XVII International Scientific Symposium on Transport Systems 2010 : Opatija - Croatia, 22- 23 April, 2010, (Suvremeni promet, Vol. 30, no. 3/4, 2010). [Zagreb]: Hrvatsko znanstveno društvo za transport = Croatia scientific society for transport, 2010, vol. 2, str. 298-301, ilustr.

LIPAR, Peter, KOSTANJŠEK, Jure, ŽURA, Marijan. Uporaba prostorske statistike za določevanje zgostitev prometnih nesreč = Identification of road accident hot spots using spatial statistics. Geod. vestn., 2010, letn. 54, št. 1, str. 61-69, ilustr. Dostopno na: [http://www.geodetski-vestnik.com/54/1/gv54-1\\_061-069.pdf](http://www.geodetski-vestnik.com/54/1/gv54-1_061-069.pdf).

LIPAR, Peter, LAKNER, Mitja, MAHER, Tomaž, ŽURA, Marijan. Estimation of road centerline curvature from raw GPS data. The Balt. j. road bridge eng., 2011, letn. 6, št. 3, str. 163-168, ilustr., doi: 10.3846/bjrbe.2011.21.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                              |
|----------------------|------------------------------|
| <b>Predmet:</b>      |                              |
|                      | <b>TRDNOST</b>               |
| <b>Course title:</b> |                              |
|                      | <b>STRENGTH OF MATERIALS</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 2. letnik | Zimski   |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1001 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 60         | 0       | 45   | 0             | 0                    | 105             | 7    |

|                                   |             |
|-----------------------------------|-------------|
| <b>Nosilec predmeta/Lecturer:</b> | Dejan Zupan |
|-----------------------------------|-------------|

|                                    |                                           |
|------------------------------------|-------------------------------------------|
| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni/Obligatory professional |
|------------------------------------|-------------------------------------------|

|                          |                      |             |
|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>                                      | <b>Prerequisites:</b>                                                                |
|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Opravljen izpit iz predmetov Statika, Fizika in Inženirska matematika I oz. osvojena ustrezna primerljiva znanja. | Passed exams in Statics, Physics, and Engineering mathematics I or similar subjects. |

| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Osnove mehanike deformabilnega telesa: koncept deformiranja in gibanja telesa, materialni in prostorski opis gibanja; kinematične enačbe deformabilnega telesa (tenzor deformacij in vektor pomikov deformabilnega telesa, geometrijski pomen normalnih in strižnih deformacij, ravninsko deformacijsko stanje);</p> <p>Ravnotežne enačbe deformabilnega telesa (napetostni vektor, napetostni tenzor, normalna in strižna napetost, ravninsko napetostno stanje,</p> | <p>Fundamental concepts and principles in mechanics of deformable body: Deformations and displacements. Material and spatial description of a deformable body. Kinematics of deformable body: the strain tensor and the vector field of displacements. Strain measures and geometric interpretation of strain tensor. Plane strain.</p> <p>Equilibrium of deformable body. Stress vector and stress tensor. Normal and shear stresses. Plane stress. Principal stresses. Generalized Hooke's law,</p> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>glavne normalne napetosti); posplošeni Hookov zakon (elastični modul, Poissonov količnik, strižni modul); osnovne enačbe linearne teorije elastičnosti in reševanje na konceptualnem nivoju in z uporabo računalniškega programa; izrek o virtualnih pomikih in izrek o virtualnih silah; značilne konstitutivne enačbe gradbenih materialov (hiperelastični modeli, plastični modeli, viskoelastični modeli).</p> <p>Analiza linijskih konstrukcij: osnovne predpostavke in enačbe upogiba z osno silo, račun notranjih sil, deformacij in pomikov preprostih elastičnih nosilcev z metodo direktne integracije, račun normalnih in strižnih napetosti v prečnem prerezu nosilca, glavne napetosti, geometrijske karakteristike prečnega prereza; osnovne predpostavke in enačbe enakomerne torzije, račun napetosti pri nosilcu s tankostenskim prečnim prerezom, torzijski vztrajnostni moment; analiza elastičnih linijskih konstrukcij z metodo pomikov in metodo sil, togostna matrika in obtežni vektor, vplivnice in ovojnice statično nedoločenih linijskih konstrukcij; osnovne enačbe geometrijsko nelinearne teorije ravninskih nosilcev, uklon elastičnega stebra, uklonska nosilnost stebra in vpliv različnih nepopolnosti na njegovo nosilnost, stabilnost konstrukcij.</p> | <p>Young's modulus, Poisson ratio, shear modulus. Governing equations of elastic body. Solution strategies at a conceptual level. Solutions with computer programs. Principle of virtual work. Principle of virtual displacements and principle of virtual forces. Constitutive models of engineering materials: hyperelastic, plastic, viscoelastic.</p> <p>Analysis of beam-like structures: Pure bending. Assumptions. Differential equation of the deflection curve. Normal and shear stresses in bending. Principal stresses. Geometric properties of plane cross-sections. Torsion. Fundamental equations of pure torsion. Shear stresses in thin-walled beams. Torsional constant. Linear analysis of elastic frames. Displacement method. Method of forces. Statically indeterminate frame structures. Envelopes and influence lines. Geometrically nonlinear beams. Buckling of elastic columns. Load carrying capacity and imperfections. Structural stability.</p> |
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#### Temeljna literatura in viri/Readings:

Izbrana poglavja iz:

Stanek, M. in Turk, G. 2008. Osnove mehanike trdnih teles : [univerzitetni učbenik]. Ponatis. V Ljubljani: Fakulteta za gradbeništvo in geodezijo, 254 str., ilustr.

Stanek, M. in TURK, G. 2002. Trdnost, študijsko gradivo. Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo. Dostopno na: <http://km.fgg.uni-lj.si/PREDMETI/Trdnost-OG/Literat.htm>,

Srpčič, S. 2003. Mehanika trdnih teles. Ljubljana: Fakulteta za gradbeništvo in geodezijo, 651 str.

Zupan, D. 2013. Trdnost : gradivo za vaje na študiju 1. stopnje Operativno gradbeništvo. Ljubljana: Fakulteta za gradbeništvo in geodezijo, 1 optični disk (CD-ROM).

Saje, M, in Zupan, D. 2013. NODI : odprtokodni program za nelinearno dinamično analizo ravninskih okvirjev : gradivo pri predmetih Kinematika in dinamika in Numerične metode v teoriji konstrukcij. Ljubljana: Fakulteta za gradbeništvo in geodezijo, 1 optični disk (CD-ROM).

#### Cilji in kompetence:

Cilji:

- spoznati osnovne mehanske koncepte pri analizi deformabilnega telesa in gradbenih konstrukcij (upogib z osno silo, enakomerna torzija),

#### Objectives and competences:

Objectives:

- learn the elementary concepts of the analysis of deformable bodies and engineering structures (bending, torsion),



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>- predstaviti pojav uklona stebra in vpliv različnih nepopolnosti na njegovo uklonsko nosilnost,</li> <li>- naučiti osnovne metode reševanja elastičnih, linijskih konstrukcij z in brez uporabe računalniškega programa.</li> </ul> <p>Predmetnospecifične kompetence:</p> <ul style="list-style-type: none"> <li>- razumevanje, interpretiranje in kritično presojanje rezultatov različnih analiz gradbenih konstrukcij,</li> <li>- razumevanje osnovnih metod reševanja preprostih statično določenih in nedoločenih linijskih gradbenih konstrukcij,</li> <li>- razumevanje določitve uklonske nosilnosti stebrov,</li> <li>- uporaba računalniških programov za analizo gradbenih konstrukcij.</li> </ul> | <ul style="list-style-type: none"> <li>- present the buckling phenomenon and study it for elastic columns with or without imperfections,</li> <li>- learn the fundamental methods for the analysis of statically determinate and indeterminate structures (with or without computer program).</li> </ul> <p>Competences:</p> <ul style="list-style-type: none"> <li>- understanding, interpretation and critical evaluation of data and results of various static analyses of statically determinate and indeterminate structures,</li> <li>- ability to understand, formulate and solve linear elasticity equations of simple statically determinate and indeterminate frames,</li> <li>- understanding of buckling and ability to determine the critical buckling load of elastic columns,</li> <li>- ability to use simple computer programs for structural analysis.</li> </ul> |
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**Predvideni študijski rezultati:****Študent**

- bo sposoben uporabiti osnovne enačbe linearne teorije elastičnosti pri modeliranju obnašanja gradbenih konstrukcij (upogib z osno silo, enakomerna torzija),
- bo sposoben razložiti osnovne reološke pojave in pripadajoče modele gradbenih materialov,
- bo poznal pojav uklona in znal določiti ter uklonske sile stebrov,
- bo sposoben določiti statične, deformacijske in kinematične količine linijskih gradbenih konstrukcij z in brez uporabe računalniških programov,
- bo sposoben sistematično analizirati problem, kritično oceniti in predstaviti rezultate,
- bo sposoben uporabiti domačo in tujo strokovno literaturo kot podlago za reševanje raznovrstnih problemov.

**Intended learning outcomes:****Student**

- will be able to use the fundamental equations of linear theory of elasticity in basic modelling of the structural behaviour (buckling, torsion),
- will be able to explain rheological properties of materials and constitutive models of engineering materials,
- will understand the buckling phenomenon and will be able to determine the Euler buckling loads,
- will be able to determine displacements, rotations, strains and stresses in statically determinate and indeterminate frames with and without software for structural analysis,
- will be able to analyse problems in a systematic manner, critically estimate and represent the results,
- will be able to use Slovene and foreign professional literature as a basis for problem solving.

**Metode poučevanja in učenja:**

Predavanja, vaje, demonstracije na modelih in z računalniškimi programi.

**Learning and teaching methods:**

Lectures, exercises, demonstrations using science toys and computer programs.

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                             |         |                                   |
|-----------------------------|---------|-----------------------------------|
| ustni izpit, teoretični del | 30,00 % | final oral exam, theoretical part |
| 3 kolokviji                 | 30,00 % | 3 midterm exams                   |
| pisni izpit, računski del   | 40,00 % | final exam, practical part        |

**Reference nosilca/Lecturer's references:**

ČEŠAREK, Peter, SAJE, Miran, ZUPAN, Dejan. Dynamics of flexible beams: Finite-element formulation based on interpolation of strain measures. Finite elem. anal. des. letn. 72, str. 47-63, 2013.

RODMAN, Urban, SAJE, Miran, PLANINC, Igor, ZUPAN, Dejan. The lateral buckling of timber arches. International journal of structural stability and dynamics, letn. 13, št. 8, str. 1-16, 2013.

ČEŠAREK, Peter, SAJE, Miran, ZUPAN, Dejan. Kinetically exact curved and twisted strain-based beam. Int. j. solids struct., letn. 49, št. 13, str. 1802-1817, 2012.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                   |
|----------------------|-----------------------------------|
| <b>Predmet:</b>      |                                   |
|                      | <b>GEOTEHNIČNE GRADNJE</b>        |
| <b>Course title:</b> |                                   |
|                      | <b>GEOTECHNICAL CONSTRUCTIONS</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 2. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1002 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 60         | 10      | 0    | 45            | 5                    | 120             | 8    |

|                                   |               |
|-----------------------------------|---------------|
| <b>Nosilec predmeta/Lecturer:</b> | Boštjan Pulko |
|-----------------------------------|---------------|

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| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni/Obligatory professional |
|------------------------------------|-------------------------------------------|

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|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

|                                                                              |                                                                                             |
|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b>                                                                       |
| Opravljen izpit iz predmetov Inženirska matematika I, Gradiva in Fizika.     | Passed exams in Engineering mathematics I, Construction and building materials and Physics. |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Preiskave trdnosti in deformabilnosti zemljin; izračun pomikov temeljnih tal po teoriji elastičnosti; mejna napetostna stanja v tleh -stabilnost tal in pobočij; osnove plitvega in globokega temeljenja (potrebne raziskave, načrtovanje, tehnologije); nosilnost tal pod plitvimi točkovnimi in pasovnimi temelji. Globoko temeljenje objektov (tehnologije, nosilnost in posedki osno obremenjenih pilotov); zemeljski pritiski, preproste težnostne podporne konstrukcije; gradnja objektov v odprti gradbeni jami, oporne konstrukcije; terenske preiskave tal; | Investigation of the strength and deformability of soils (triaxial testing of soils); calculation of ground settlements according to the theory of elasticity; limit stress states in the soil - slope stability; basics of shallow and deep foundations (necessary research, design, technology); bearing capacity of soils for shallow foundations; deep foundations (technology, bearing capacity and settlements of axially loaded piles); earth pressures, design of simple retaining walls; foundations in an open construction pit, retaining walls; field testing of soils |

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| načrtovanje in gradnja nasipov; načrtovanje in gradnja vkopov; masna bilanca zemeljskih del, priprava temeljnih tal; odvodnjavanje, dreniranje; osnove uporabe geosintetikov. | (design methods based on field tests); earthworks (design and construction of embankments and slope excavations, preparation of ground, drainage); fundamentals on use of geo-synthetics. |
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**Temeljna literatura in viri/Readings:**

Izbrana poglavja iz:

Majes, B. 2006. Skripta za predmet mehanika tal s temeljenjem, Ljubljana, 258 str.

SIST EN 1997-1, Geotehnično projektiranje – 1. del: Splošna pravila. 2006. 148 str.

Šuklje, L. 1984. Mehanika tal. Ljubljana, Univerza v Ljubljani, Fakulteta za arhitekturo, gradbeništvo in geodezijo, 359 str.

Holtz, R.D., Kovacs W.D. 1981. An Introduction to geotechnical engineering. New Jersey, Prentice-Hall Inc., Englewood Cliffs, 733 str.

Logar, J., Majes, B. 2006. Skripta za predmet geotehnične gradnje, Ljubljana, 172 str.

Učno gradivo v spletni učilnici.

**Cilji in kompetence:**

Cilji:

- usvojiti osnove mehanike tal in temeljenja ter razumeti bistvene posebnosti v primerjavi z ostalimi področji gradbeništva (odvisnost od preiskav tal, večfaznost in nelinearnost zemljin, 3D prostor).

Predmetnospecifične kompetence:

- razumevanje preprostih geotehničnih poročil o preiskavah tal in osnovnih tehnik preiskovanja,  
- obvladovanje računanja nosilnosti in posredkov temeljev v homogenih tleh pri plitvem in globokem temeljenju,  
- obvladovanje analiziranja preprostih težnostnih podpornih konstrukcij,  
- razumevanje glavnih značilnosti na področju zemeljskih del.

**Objectives and competences:**

Objectives:

- to acquire the basics of soil mechanics and foundation and understand its essential specifics and comparison to other areas of construction (dependence on ground investigations, the nonlinearity of soil, 3D space).

Competences:

- understanding of simple geotechnical reports and ground investigation techniques,  
- design and computation of bearing capacity and settlements foundation in homogeneous soils for shallow and deep foundations,  
- design and analysis of simple gravity retaining walls and retaining structures,  
- understanding of earthwork basics.

**Predvideni študijski rezultati:**

Študent

- bo sposoben identificirati probleme in izračunati nosilnost tal, stabilnost tal in zemeljske pritiske,  
- bo sposoben uporabiti osnovna načela gradnje nasipov, vkopov in odvodnje, priprave temeljnih tal, uporabe geosintetikov in tehnologije gradnje plitvih in globokih temeljev,

**Intended learning outcomes:**

Student

- will be able to identify problems and calculate soil shear strength and bearing capacity of the ground, soil stability and earth pressures,  
- will be able to use basic principles of embankment construction and slope excavations, drainage, use of geo-synthetics and knowledge of

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <ul style="list-style-type: none"> <li>- bo sposoben izvesti proces geotehničnega projektiranja od raziskav do načrtovanja, izvedbe in nadzora geotehničnih del, upoštevajoč pri tem varnost pri različnih geotehničnih delih, ter opredeliti bistvene pogoje za odločanje glede plitvega in globokega temeljenja objektov,</li> <li>- bo sposoben izdelati računsko analizo posedkov, nosilnosti in stabilnosti tal ter zemeljskih plazov v procesu gradnje inženirskih konstrukcij,</li> <li>- bo sposoben kritično presojeti odločitve na področju temeljenja objektov.</li> </ul> | <p>design/construction of shallow and deep foundations and retaining structures,</p> <ul style="list-style-type: none"> <li>- will be able to perform geotechnical design process from research to planning, implementation and monitoring of earth and construction works, taking into account safety of different geotechnical works, and define essential conditions for deciding upon shallow or deep foundations of buildings,</li> <li>- will be able to perform computational analysis of foundation bearing capacity, settlements and slope stability (landslides) in the design process of various engineering structures,</li> <li>- will be able to critically assess decisions in the field of foundation engineering.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

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|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| Predavanja, seminar in vaje v obliki računskih analiz geotehničnih konstrukcij. Preverba računskega znanja s kolokviji. | Lectures, seminar and practical work in the form of geotechnical analysis of structures. |
|-------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                                  |         |                                   |
|----------------------------------|---------|-----------------------------------|
| Domače naloge                    | 7,50 %  | Individual practical work         |
| Kolokvija (2x)                   | 42,50 % | Mid-term exams (2x)               |
| Računski in/ali teoretični izpit | 50,00 % | Practical and/or theoretical exam |

**Reference nosilca/Lecturer's references:**

PULKO, Boštjan. Primerjava metod za statistično analizo temeljnih plošč = Comparision of methods for static analysis of mat foundations. Gradb. vestn., sep. 2012, letn. 61, št. 9, str. 198-205.

PULKO, Boštjan, MAJES, Bojan, MIKOŠ, Matjaž. Reinforced concrete shafts for the structural mitigation of large deepseated landslides : an experience from the Macenik and the Slano blato landslides (Slovenia). Landslides. [Print ed.], [v tisku] 2012, letn. Xx, št. X, str. 1-11.

PULKO, Boštjan, MAJES, Bojan, LOGAR, Janko. Reply to the discussion by Khabbazian, M., Meehan, C.L. and Kaliakin, V. N. on "Geosynthetic -encased stone columns: Analytical calculation model". Geotext. Geomembr.. [Print ed.], dec. 2011, letn. 29, št. 6, str. 29-32.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                            |
|----------------------|----------------------------|
| <b>Predmet:</b>      |                            |
|                      | <b>LESENE KONSTRUKCIJE</b> |
| <b>Course title:</b> |                            |
|                      | <b>TIMBER STRUCTURES</b>   |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 2. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1544 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 30   | 0             | 0                    | 60              | 4    |

|                                   |                          |
|-----------------------------------|--------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Drago Saje, Jože Lopatič |
|-----------------------------------|--------------------------|

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| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni/Obligatory professional |
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|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

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| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b>                                                        |
| Opravljen izpiti pri predmetih Gradiva in Statika.                           | Passed exams of the courses Construction and building materials and Statics. |

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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <p>Prednosti in slabosti lesenih konstrukcij. Osnovne fizikalne, mehanske in reološke lastnosti lesa in gradbenih lesnih proizvodov v odvisnosti od pogojev okolja. Pregled razpoložljivih sodobnih osnovnih gradbenih lesnih proizvodov. Razvrščanje lesa v trdnostne razrede. Temeljna izhodišča za dimenzioniranje elementov lesenih konstrukcij.</p> <p>Mejna nosilnost in dimenzioniranje elementov lesenih konstrukcij iz masivnega lesa pri osni, osno-upogibni in strižni obremenitvi. Račun in omejitve pomikov lesenih konstrukcij. Posebnosti računskih</p> | <p>Advantages and disadvantages of timber structures. Physical, mechanical and rheological properties of solid timber and engineered wood products depending on the environmental conditions. Overview of available modern basic engineered wood products for structural purposes. Strength classes and strength grading of timber.</p> <p>Basic starting points for the analysis of stress-strain state and the design of elements of timber structures. Ultimate resistance and design of timber structural elements at axial, combined bending-axial</p> |

|                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| dokazov sestavljenih nosilnih elementov lesenih konstrukcij. Posebnosti in možni načini izvedbe zavarovalnih konstrukcij. Nosilni sistemi lesenih ostrešij. Sodobni opažni sistemi. Ukrepi za zaščito lesenih konstrukcij pred zunanji vplivi. Zaščita lesenih konstrukcij pred požarom. Odpornost in podajnost veznih sredstev in priključkov. Osnovna pravila izvedbe priključkov, vozlišč in detajlov lesenih konstrukcij. | and shear loading. Calculation and limitations of deflections of timber structures. Specifics of computational proofs of composite mechanically jointed load-bearing elements of timber structures. Role and types of bracing systems. Load-bearing systems of wooden roofs. Modern timber formwork systems for concrete. Measures for the protection of timber structures against impact of the environment. Protection of timber structures against fire. Resistance and stiffness of fasteners and joints. Basic rules for the execution of joints, nodes and details of timber structures. |
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**Temeljna literatura in viri/Readings:**

Izbrana poglavja iz:

Thelandersson, S., Larsen, H.J. (urednika). 2003. Timber Engineering, Wiley, strani 13-102.

Ambrose, J. 1994. Simplified Design of Wood Structures-fifth edition, strani 167-212, John Wiley & Sons.

Dobrila, P. 1997. Lesene konstrukcije-rešeni primeri z uporabo in razlago EC5, Univerza v Mariboru, Fakulteta za gradbeništvo, 133 strani.

Ustrezni deli standardov za gradbene konstrukcije Evrokod 0, Evrokod 1, Evrokod 5 (SIST EN 1990, SIST EN 1991-1, SIST EN 1991-1-3, SIST EN 1991-1-4, SIST EN 1995-1-1, SIST EN 1995-1-2).

Lopatič, J. 2015. Študijsko gradivo za predmet Lesene konstrukcije, UL FGG.

**Cilji in kompetence:**

Cilji:

- spoznati in razumeti fizikalne, mehanske in reološke lastnosti lesa in lesnih proizvodov ter osnovne nosilne sisteme lesenih konstrukcij.

Predmetnospecifične kompetence:

- obvladovanje osnovnega dimenzioniranja elementov lesenih konstrukcij iz masivnega lesa, vključno z veznimi sredstvi oziroma priključki,  
- razumevanje in obvladovanje pogojev in ukrepov za zagotavljanje trajnosti in požarne odpornosti ter možnih izvedb zavarovalnih konstrukcij.

**Objectives and competences:**

Objectives:

- to identify and understand physical, mechanical and rheological properties of solid timber and engineered wood-based products as well as basic load-bearing systems of timber structures.

Competences:

- mastering the basic design of elements of timber structures made of solid timber, including fasteners and joints,  
- understanding and mastering the conditions and measures to assure durability and fire resistance as well as possible alternative bracing systems.

**Predvideni študijski rezultati:**

Študent

- bo pri projektiranju pravilno upošteval pomembnejše mehanske in reološke lastnosti lesa,

**Intended learning outcomes:**

Student

- will adequately take into account main mechanical and rheological properties of timber in structural design,

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <ul style="list-style-type: none"> <li>- bo spoznal tehnologije izdelave osnovnih gradbenih lesnih proizvodov,</li> <li>- bo sposoben upoštevati glavne zahteve tehnične regulative s področja lesenih konstrukcij,</li> <li>- bo pri projektiranju lesenih konstrukcij sposoben uporabiti ustrezna načela dokazovanja varnosti in uporabnosti,</li> <li>- bo sposoben izbrati ustrezno tehnologijo sodobnih opažnih sistemov,</li> <li>- bo sposoben izbrati primeren statični sistem enostavnih lesenih ostrešij,</li> <li>- bo sposoben izbrati primerno zavarovalno konstrukcijo.</li> </ul> | <ul style="list-style-type: none"> <li>- will get familiar with manufacturing technologies of main engineered wood products for structural purposes,</li> <li>- will be able to consider demands of technical regulations from the area of timber structures,</li> <li>- will be able to consider adequate principles of verifying safety and serviceability in design of timber structures,</li> <li>- will be able to choose suitable technologies of modern formwork systems for concrete structures,</li> <li>- will be able to choose appropriate structural system of simple wooden roofs,</li> <li>- will be able to choose appropriate bracing.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                     |                         |
|---------------------|-------------------------|
| Predavanja in vaje. | Lectures and tutorials. |
|---------------------|-------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                       |         |                            |
|-----------------------|---------|----------------------------|
| Računski del izpita   | 30,00 % | Computational part of exam |
| Vaje                  | 30,00 % | Tutorials                  |
| Teoretični del izpita | 80,00 % | Theoretical part of exam   |

**Reference nosilca/Lecturer's references:**

PLANINC, Igor, SCHNABL, Simon, SAJE, Miran, LOPATIČ, Jože, ČAS, Bojan. Numerical and experimental analysis of timber composite beams with interlayer slip. Engineering structures, ISSN 0141-0296. [Print ed.], 2008, letn. 30, št. 11, str. 2959-2969.

MOŽE, Primož, BEG, Darko, LOPATIČ, Jože. Net cross-section design resistance and local ductility of elements made of high strength steel. Journal of Constructional Steel Research, ISSN 0143-974X. [Print ed.], 2007, letn. 63, št. 11, str. 1431-1441.

LOPATIČ, Jože, SAJE, Drago, SAJE, Franc. Creep of timber structures. International journal for engineering modelling, ISSN 1330-1365, 2005, vol. 18, no. 1/2, str. 1-10.

SAJE, Drago, BANDELI, Branko, ŠUŠTERŠIČ, Jakob, LOPATIČ, Jože, SAJE, Franc. Autogenous and Drying Shrinkage of Fibre Reinforced High-Performance Concrete. J. adv. Concr. Technol., feb. 2012, letn. 10, št. 2, str. 59-73, ilustr., doi: 10.3151/jact.10.59.

SAJE, Drago, SAJE, Franc, LOPATIČ, Jože. Compressive strength of concrete containing silica fume. Journal of the mechanical behaviour of materials, 2009, letn. 19, št. 6, str. 355-364.

SAJE, Drago, LOPATIČ, Jože. The effect of constituent materials on the time development of the compressive strength of high-strength concrete. Mag. Concr. Res., 2010, letn. 62, št. 4, str. 291-300.



## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                                        |
|----------------------|--------------------------------------------------------|
| <b>Predmet:</b>      |                                                        |
|                      | <b>OSNOVE MASIVNIH KONSTRUKCIJ</b>                     |
| <b>Course title:</b> |                                                        |
|                      | <b>FUNDAMENTALS OF CONCRETE AND MASONRY STRUCTURES</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 2. letnik | Letni    |

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| <b>Univerzitetna koda predmeta/University course code:</b> | 1004 |
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| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 60         | 0       | 60   | 0             | 0                    | 120             | 8    |

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| <b>Nosilec predmeta/Lecturer:</b> | Tatjana Isakovič |
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| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni/Obligatory professional |
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| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

|                                                                                |                                                                                |
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| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>   | <b>Prerequisites:</b>                                                          |
| Opravljeni izpiti iz predmetov (ali njihovih ekvivalentov) Gradiva in Statika. | Passed exams in the topics of Construction and building materials and Statics. |

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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Lastnosti in zgodovinski razvoj masivnih konstrukcij. Metoda mejnih stanj in varnostni faktorji za masivne konstrukcije. Mehanske lastnosti materialov (betona, jekla in zidovja). Projektiranje armiranobetonskih elementov: mejno stanje prereza in dimenzioniranje pri upogibu z osno silo, strigu in torziji in izbira začetnih dimenzij mejna stanja uporabnosti (kontrola razpok in načela računa povesov) konstruiranje armiranobetonskih elementov (razporejanje in oblikovanje armature, sidranje, preklopi, stebri, grede, stene, globoki | Characteristics of concrete and masonry structures illustrated by their historical development. Limit state method and partial safety factors for concrete and masonry structures. Mechanical properties of the materials (for concrete, steel and masonry). Design of reinforced concrete elements: Ultimate limit states of the reinforced concrete (RC) cross-section and design for flexure with axial load, shear and torque as well as the preliminary sizing of RC members; Serviceability limit states (the control of the crack widths and the basic principles of the |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| <p>nosilci in kratke konzole) osnove projektiranja (s tabelami) in konstruiranja AB plošč izdelava armaturnih načrtov in spiska armature temeljni konstrukterski ukrepi za zagotavljanje potresne odpornosti AB elementov. Osnovni pojmi iz prednapetega betona (ideja, izvedba, materiali, izgube prednapetja – informativno in pojem kabelske linije)</p> <p>Projektiranje zidov: vrste zidakov in zidovja mejna strižna in upogibna nosilnost zida in dimenzioniranje osnove gradnje in utrjevanja zidanih stavb na potresnih območjih Temeljna pravila in predpisi za izvedbo masivnih konstrukcij.</p> | <p>calculations of deflections); Detailing of RC members (detailing of reinforcement, anchorage, laps, columns, beams, walls, deep beams, corbels); Fundamentals of the design (using the design tables) and detailing of RC slabs; Reinforcement plans drawings and lists; Fundamentals of the structural design of the earthquake resistant RC members; Fundamentals of the prestressed concrete (idea, technologies, materials, short information about prestress losses, tendon line).</p> <p>Design of masonry: Masonry units; Masonry structural systems; Shear and flexural capacity of a masonry wall and related design; Fundamentals of the construction and retrofit of masonry buildings in seismic regions; Basic rules and codes for the construction of masonry structures.</p> |
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**Temeljna literatura in viri/Readings:**

Izbrana poglavja iz:

Fischinger, M. Osnove masivnih konstrukcij, UL, FGG, učbenik v pripravi, 150 strani.

Isaković, T., Fischinger, M. Zbirka rešenih nalog iz projektiranja AB konstrukcij z uporabo standradov Eurokod, pred izidom, 186 strani.

Fischinger, M., et al. "DIAS : programski sistem za dimenzioniranje in analizo armiranobetonskih stavb : Priročnik za verzijo 1.0 (Poročilo IKPIR, 3/93). 1993. Ljubljana, FAGG, Oddelek za gradbeništvo in geodezijo, Inštitut za konstrukcije, potresno inženirstvo in računalništvo, Dostopno na računalnikih v računalniških učilnicah na FGG.

Sorić, Z. 1999. Zidane konstrukcije I, Hrvatski savez građevinskih inženjera, izbrane teme iz poglavij 1, 2, 3, 4, 8, 9 in 10 (izbrane teme iz skupaj 167 strani)

Učno gradivo v spletni učilnici in na <http://www.ikpir.fgg.uni-lj.si/EASY> .

SIST EN 1992-1-1 Eurokod 2: Projektiranje betonskih konstrukcij -Del 1-1: Splošna pravila in pravila za stavbe, 2004. (Urad za standardizacijo in meroslovje RS), 230 strani.

**Cilji in kompetence:**

Cilji:

- pridobiti potrebne osnove za projektiranje betonskih in zidanih konstrukcij in informativno o prednapetih betonskih konstrukcijah.

Predmetnospecifične kompetence:

- obvladovanje mejnega stanja v prerezu,
- osvojitve osnovnih postopkov dimenzioniranja in konstruiranja,
- poznavanje ustreznih predpisov za projektiranje in gradnjo masivnih objektov.

**Objectives and competences:**

Objectives:

- to get fundamental skills how to design concrete and masonry structures and only information about prestressed structures.

Competences:

- understanding of the ultimate states,
- mastering of the basic procedures needed for design, proportioning and detailing,
- knowledge of the relevant codes for the design and construction of concrete and masonry buildings.

**Predvideni študijski rezultati:****Študent**

- bo sposoben dimenzionirati betonske prereze in zidove na osnovne obremenitve (upogib z osno silo, strig in torzijo),
- bo sposoben prepoznati kritično kombinacijo vplivov in ustrezne varnostne faktorje za mejna stanja nosilnosti in uporabnosti,
- bo sposoben razložiti konstrukcijske detajle za tipične elemente masivnih konstrukcij, temeljne principe pri zagotavljanju duktilnostii armiranobetonskih prereзов in zidovja,
- bo sposoben uporabiti predpise za projektiranje in graditev armiranobetonskih in zidanih konstrukcij, bistvene zahteve v predpisih, še posebej za izvedbo masivnih konstrukcij,
- bo sposoben pripraviti projekt gradbenih konstrukcij: dimenzionirati armiranobetonske prereze in zidove na kritično kombinacijo vplivov z ustreznimi varnostnimi faktorji ter izdelati armaturne načrte temeljnih elementov betonskih konstrukcij,
- bo sposoben delati na gradbišču pri izvedbi masivnih konstrukcij,
- bo sposoben uporabiti inženirske modele in splošen program za račun in dimenzioniranje konstrukcij.

**Intended learning outcomes:****Student**

- will be able to design/proportion the cross-sections of the reinforced concrete and masonry elements subjected to basic types of loadings (flexure with axial force, shear and torque),
- will be able to identify and take into account critical combinations of load actions and to apply adequate safety factors for the ultimate and serviceability limit states,
- will be able to explain structural details for typical elements of the masonry and concrete structures, the role of specific reinforcement details, ductility of reinforced concrete and masonry elements and the basic principles how to provide this ductility,
- will be able to use the structural codes (Eurocodes) for the design and construction of reinforced concrete and masonry structures, the basic requirements for the construction of concrete and masonry structures,
- will be able to prepare the design documentation for (reinforced) concrete and masonry structures: to design the reinforced concrete and masonry elements for critical load combinations and to prepare the relevant reinforcement plan,
- will be able to work on the construction sites,
- will be able to use engineering models and a general computer program for the design of structure.

**Metode poučevanja in učenja:**

Predavanja in naloge iz projektiranja armiranobetonskih in (v nekaj manjši meri) zidanih konstrukcij. Vaje vključujejo tudi risanje preprostih armaturnih načrtov.

**Learning and teaching methods:**

Lectures and assignments to design and detail (including reinforcement plans) reinforced/concrete and (to somewhat lesser extend) masonry structures.

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                                               |          |                                            |
|-----------------------------------------------|----------|--------------------------------------------|
| Kolokvij in                                   | 40,00 %  | Midterm exam and                           |
| Končni izpit (oba dela morata biti pozitivna) | 60,00 %  | Final exam (both parts should be positive) |
| Končni izpit (velja boljša ocen)              | 100,00 % | Final exam (the better grade prevails)     |

**Reference nosilca/Lecturer's references:**

ZOUBEK, Blaž, FISCHINGER, Matej, KANTE, Peter, ISAKOVIĆ, Tatjana, FAHJAN, Yasin, FISCHINGER, Matej. Cyclic failure analysis. Shake-table response of the beam-to-column dowel connections in precast industrial buildings. Eng. struct.. [Print ed.], jul. 2013, letn. 52, str. 179-191, ilustr., doi: 10.1016/j.engstruct.2013.02.028.

REJEC, Klemen, ISAKOVIĆ, Tatjana, FISCHINGER, Matej. Seismic shear force magnification in a coupled RC cantilever wall with thin T-shaped piers. Journal of structural walls, designed according to Eurocode 8. Bulletin of earthquake engineering, apr. 2012 ISSN 0733-9445. [Print ed.], maj 2017, letn. 10143, št. 25, str. 567-5861-16, ilustr., doi: 10.1007/s10518-011-9294-y1061/(ASCE)ST.1943-541X.0001718.

VIDRIH, Zlatko ZOUBEK, Blaž, FISCHINGER, Matej, ISAKOVIĆ, Tatjana. Seismic response of short restrainers used to protect cladding panels in RC precast buildings. Journal of vibration and control : JVC, ISSN 1077-5463. [Tiskana izd.], 2016, str. 1-14, ilustr., doi: 10.1177/1077546316659780.

ANŽLIN, Andrej, FISCHINGER, Matej, ISAKOVIĆ, Tatjana. Numerical investigation on smart magnetically controlled elastomeric bearings. J. vib. control, nov. 2012, letn. 18, št. 13 Cyclic response of I-shaped bridge columns with substandard transverse reinforcement. Engineering structures, ISSN 0141-0296. [Print ed.], sept. 2015, letn. 99, str. 2073-2084 642-652, ilustr., doi: 10.1177/1077546311429060.1016/j.engstruct.2015.05.032. [COBISS.SI-ID 7075169]

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                      |
|----------------------|--------------------------------------|
| <b>Predmet:</b>      |                                      |
|                      | <b>STATIKA GRADBENIH KONSTRUKCIJ</b> |
| <b>Course title:</b> |                                      |
|                      | <b>STRUCTURAL ANALYSIS</b>           |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 2. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1000 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 30   | 0             | 0                    | 60              | 4    |

|                                   |                               |
|-----------------------------------|-------------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Matija Gams, Tatjana Isaković |
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| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni/Obligatory professional |
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| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

|                                                                              |                                                                                                                |
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| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b>                                                                                          |
| Opravljeni izpiti: Fizika, Inženirska matematika I, Gradiva, Statika.        | Passed exams of the courses: Physics, Engineering mathematics I, Construction and building materials, Statics. |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Predmet je zasnovan tako, da študent praktično uporabi znanje, ki bo posredovano na predavanjih, in sicer: osnovno inženirsko modeliranje vplivov na konstrukcije v skladu z veljavnimi standardi (vključeni bodo stalni in spremenljivi vplivi ter osnovno najbolj preprosto modeliranje vplivov snega in vetra); osnove inženirskega modeliranja konstrukcij; računanje učinkov vplivov v tipičnih enostavnih ravninskih linijskih konstrukcijah, obremenjenih s statičnimi vplivi, s posebnim | The basis of the course is the practical application of the following topics presented within the lectures: engineering modelling of basic actions on building structures according to relevant standards: Self-weight, variable actions, snow, wind; basics of the engineering modelling of building structures (structural elements, supports, connections between structural elements, materials); analysis of statically determinate structures (trusses, frames, grids) subjected to static actions with special emphasis on |

|                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| poudarkom na fizikalnem razumevanju in hitri določitvi učinkov vplivov; poenostavljeni praktični računi vplivov v ploščah; osnovna praktična uporaba računalniškega programa za račun ravninskih linijskih konstrukcij. | the understanding the physical significance of all analysed issues: Computation of reactions and internal forces, Computation of displacements based on differential equation and virtual work method. Analysis of statically indeterminate structures using force based method with special emphasis on the understanding of the physical significance of all analysed issues. Analysis of displacements in statically indeterminate structures based on the virtual work method. Engineering analysis of slabs: Analysis of slabs supported by beams and columns: one and two-way slabs; Simplified analysis of flat slabs. Basic use of the computer programme for the analysis of trusses, frames and grids. |
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**Temeljna literatura in viri/Readings:**

Izbrana poglavja iz:

Duhovnik, J. 2005. Statika linijskih konstrukcij I, Univerza v Ljubljani, FGG, str. 1-66 in 108–124.

Reflak, J. 2000. Osnove plošč, skripta, 72 strani.

SAP 2000, Linear and Nonlinear Static and Dynamic Analysis and Design of Three-Dimensional Structures, Basic Analysis Reference Manual, Computers and Structures, 2012, – izbrana poglavja, ki se nanašajo na osnovno uporabo programa (dostopno na računalnikih v računalniških učilnicah na FGG).

Standardi: SIST EN 1990, Evrokod – Osnove projektiranja konstrukcij, Urad za standardizacijo in meroslovje RS, 2004. SIST EN 1991-1-1, Evrokod 1: Vplivi na konstrukcije – Del 1-1: Splošni vplivi – Specifične teže, lastna teža, koristne obtežbe stavb, Urad za standardizacijo in meroslovje RS 2004. SIST EN 1991-1-3, Evrokod 1: Vplivi na konstrukcije – Del 1-3: Obtežbe snega, Urad za standardizacijo in meroslovje RS, 2002. SIST EN 1991-1-4, Evrokod 1: Vplivi na konstrukcije – Del 1-4: Vplivi vetra, Urad za standardizacijo in meroslovje RS, 2002.

**Cilji in kompetence:**

Cilji:

- študent s kritično analizo praktičnih primerov pridobi osnovno znanje o inženirskem modeliranju statičnih vplivov in gradbenih konstrukcij v skladu z veljavnimi standardi in
- je sposoben samostojno modelirati in analizirati enostavne gradbene konstrukcije, ki jih v celoti ali po posameznih delih lahko analiziramo kot linijske ravninske konstrukcije.
- Na praktičnih primerih pridobi znanje, potrebno za poenostavljeni račun vplivov v ploščah, ter praktično znanje za osnovno uporabo računalniških programov za analizo enostavnih gradbenih konstrukcij.

Predmetnospecifične kompetence:

**Objectives and competences:**

Objectives:

- based on critical analysis and case studies students gain the basic knowledge about the engineering modelling of actions on structures and engineering modelling of buildings according to relevant standards.
- Students gain the competences to model and analyse simple buildings that can be modelled (a whole structure or its parts) using beam-column elements (structural systems: frames, grids, trusses).
- They obtain knowledge to be able to perform simplified analyses of slabs.
- They gain the basic skills for the use of the computer programmes for the analysis of structures.

Competences:

|                                                                                      |                                                                                               |
|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| - študent razume in obvlada modeliranje in analizo enostavnih gradbenih konstrukcij. | - students gain knowledge and understanding about modelling and analysis of simple buildings. |
|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|

**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Študent</p> <ul style="list-style-type: none"> <li>- bo sposoben identificirati enostavne gradbene konstrukcije oziroma njihove dele, ki se lahko modelirajo kot linijske ravninske konstrukcije,</li> <li>- bo sposoben določiti in modelirati statične vplive za primer enostavnih gradbenih konstrukcij,</li> <li>- bo sposoben uporabiti osnovne principe inženirskega modeliranja za določitev primernih numeričnih modelov enostavnih gradbenih konstrukcij (ravninski okviri, paličja in mreže), obremenjenih s statičnimi vplivi,</li> <li>- bo sposoben uporabiti enostavne postopke za analizo enostavnih gradbenih konstrukcij (ravninski okviri, paličja in mreže),</li> <li>- bo sposoben uporabiti računalniški program za analizo enostavnih gradbenih konstrukcij (ravninski okviri, paličja in mreže),</li> <li>- bo sposoben uporabiti enostavne postopke za račun učinkov vplivov v ploščah,</li> <li>- bo sposoben vzpostaviti relacijo med dejanskimi gradbenimi konstrukcijami in ustreznimi računskimi modeli; med dejanskimi vplivi na konstrukcije in ustreznimi računskimi modeli; med fizikalnim odzivom konstrukcije in njegovim matematičnim modelom.</li> </ul> | <p>Student</p> <ul style="list-style-type: none"> <li>- will be able to identify simple building structures and their sub- assemblages that can be modelled as plane structures using beam- column elements,</li> <li>- will be able to identify and model static actions in simple building structures,</li> <li>- will be able to use basic principles of the engineering modelling to define appropriate numerical models of simple building structures (plane frames, trusses and grids) subjected to static actions,</li> <li>- will be able to use simple analytical procedures for the analysis of typical simple building structures (plane frames, trusses and grids),</li> <li>- will be able to use the computer programme for the analysis of simple building structures,</li> <li>- will be able to use simple analytical procedures for the analysis of actions' effects in slabs,</li> <li>- will be able to establish the relationship between real structures and their numerical models; between real actions on structures and their numerical models; between the response of structure and its numerical model.</li> </ul> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                  |                                   |
|----------------------------------|-----------------------------------|
| Predavanja, vaje, domače naloge. | Lectures, seminars and tutorials. |
|----------------------------------|-----------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|          |         |               |
|----------|---------|---------------|
| Izpit    | 60,00 % | Exam          |
| Kolokvij | 40,00 % | Mid-term exam |

**Reference nosilca/Lecturer's references:**

VIDRIH, Zlatko, FISCHINGER, Matej, ISAKOVIĆ, Tatjana. Numerical investigation on smart magnetically controlled elastomeric bearings. J. vib. Control, nov. 2012, letn. 18, št. 13, str. 2073-2084, ilustr., doi: 10.1177/1077546311429060.

ISAKOVIĆ, Tatjana, FISCHINGER, Matej. Applicability of Pushover Methods to the Seismic Analyses of an RC Bridge, Experimentally Tested on Tree Shake Tables. *Journal of earthquake engineering -JEE*, 2011, št. 2, letn. 15, str. 303-320, ilustr., doi: 10.1080/13632461003802009.

ISAKOVIĆ, Tatjana, ZEVIK, Jaka, FISCHINGER, Matej. Floor response spectra in isolated structures subjected to earthquakes weaker than the design earthquake. Part 2, Isolation with magnetically controlled elastomeric bearings. *Structural control & health monitoring*. [Print ed.], 2011, letn. 18, št. 5, str.540-553, ilustr., doi: 10.1002/stc.391.

GAMS, Matija, ANŽLIN, Andrej, KRAMAR, Miha. Simulation of shake table tests on out-of-plane masonry buildings. Part III, Two-step fem approach. *International journal of architectural heritage : conservation, analysis and restoration*, ISSN 1558-3058. [Print ed.], Sep. 2016.

<http://www.tandfonline.com/doi/full/10.1080/15583058.2016.1237589>, doi: 10.1080/15583058.2016.1237589.

TOMAŽEVIČ, Miha, GAMS, Matija. Shaking table study and modelling of seismic behaviour of confined AAC masonry buildings. *Bulletin of earthquake engineering*, ISSN 1570-761X, jun. 2012, vol. 10, issue 3, str. 863-893, ilustr., doi: 10.1007/s10518-011-9331-x.

GAMS, Matija, SAJE, Miran, PLANINC, Igor, KEGL, Marko. Optimal size, shape, and control design in dynamics of planar frame structures under large displacements and rotations. *Engineering optimization*, ISSN 0305-215X, Jan. 2010, vol. 42, iss. 1, str. 69-86, doi: 10.1080/03052150902998552.

GAMS, Matija, SAJE, Miran, SRPČIČ, Stane, PLANINC, Igor. Finite element dynamic analysis of geometrically exact planar beams. *Computers & Structures*, ISSN 0045-7949. [Print ed.], september 2007, letn. 85, št. 17/18, str. 1409-1419, ilustr. [http://www.sciencedirect.com/science?\\_ob=ArticleURL&\\_udi=B6V28-4MR1JY8-7&\\_user=4776866&\\_coverDate=09%2F30%2F2007&\\_alid=617688103&\\_rdoc=1&\\_fmt=full&\\_orig=search&\\_cdi=5696&\\_sort=d&\\_docanchor=&view=c&\\_ct=130&\\_acct=C000033658&\\_version=1&\\_urlVersion=0&\\_userid=4776866&md5=7c8c628deabfa304d39010dcd2cf229a](http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V28-4MR1JY8-7&_user=4776866&_coverDate=09%2F30%2F2007&_alid=617688103&_rdoc=1&_fmt=full&_orig=search&_cdi=5696&_sort=d&_docanchor=&view=c&_ct=130&_acct=C000033658&_version=1&_urlVersion=0&_userid=4776866&md5=7c8c628deabfa304d39010dcd2cf229a).



## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                         |
|----------------------|-------------------------|
| <b>Predmet:</b>      |                         |
|                      | <b>MASIVNI OBJEKTI</b>  |
| <b>Course title:</b> |                         |
|                      | <b>CONCRETE OBJECTS</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 3. letnik | Zimski   |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1143 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 30   | 0             | 0                    | 60              | 4    |

|                                   |                                 |
|-----------------------------------|---------------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Jože Lopatič, Sebastjan Bratina |
|-----------------------------------|---------------------------------|

|                                    |                                           |
|------------------------------------|-------------------------------------------|
| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni/Obligatory professional |
|------------------------------------|-------------------------------------------|

|                          |                      |             |
|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

|                                                                              |                                                                              |
|------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b>                                                        |
| Opravljen izpit iz predmeta Osnove masivnih konstrukcij.                     | Passed exam from the course Introduction to concrete and masonry structures. |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <p>Pogoji in zahteve snovanja, projektiranja in izvedbe masivnih konstrukcij. Računska obtežba in varnost konstrukcij. Prednosti in slabosti možnih konstrukcijskih sistemov nosilnih konstrukcij (skeleti, stenaste konstrukcije, mešane stenasto- skeletne konstrukcije). Tehnologije gradnje monolitnih in montažnih masivnih konstrukcij.</p> <p>Modeliranje obnašanja armiranobetonskih konstrukcij in detajlov z metodo razpor in nateznih vezi. Funkcije, dimenzioniranje in konstrukcijske posebnosti elementov armiranobetonskih nosilnih</p> | <p>Conditions and demands of conception, design and execution of concrete and masonry structures.</p> <p>Design load and safety of structures. Advantages and disadvantages of possible structural systems of load-bearing structures (skeleton-frame structures, wall structures, mixed frame-wall structures).</p> <p>Technologies of constructing monolithic and prefabricated concrete and masonry structures.</p> <p>Modelling of the behaviour of reinforced concrete structures and details using the strut and tie method. Role, design and specifics of elements of</p> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| <p>konstrukcij kot so: strešne in medetažne konstrukcije (nosilci, polne in votle plošče, rebričaste in rebraste ter kasetirane, branaste in sovprežne konstrukcije); stopnice; stenasti nosilci; stene in stebri; temelji; posebnosti modeliranja; analize; dimenzioniranja in izvedbe montažnih betonskih konstrukcij. Konstrukcijski sistemi zidanih konstrukcij. Projektiranje enostavnih zidanih objektov. Učinkovito konstruiranje armature in detajlov. Temeljna pravila izdelave gradbenih načrtov. Računalniško podprta izdelava pozicijskih, opaznih in armaturnih načrtov betonskih konstrukcij.</p> | <p>reinforced concrete load-bearing structures, such as: roof and floor structures (beams, solid and hollow slabs, flat slabs, ribbed, waffle or grillage slabs and composite structures); stairs; deep beams; walls and columns; foundations. Specifics of modelling, analysing, design and execution of prefabricated concrete structures. Structural systems of masonry structures. Design of simple masonry structures. Effective design and detailing of reinforcement. Basic rules of elaborating construction drawings. Computer-aided preparation of construction drawings for reinforced concrete structures (element reference drawings, shop drawings, reinforcement drawings).</p> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Temeljna literatura in viri/Readings:**

Elliott, K.S. 2002. Precast Concrete Structures. Buterworth-Heinemann, 375 strani.

Tomlinson, M.J. 2001. Foundation Design and Construction-seventh edition. Pearson Education Ltd, str. 137-174, 345-389.

Curtin, G.W., Shaw, G., Beck, J.K., Bray, W.A. 2006. Structural Masonry Designers Manual-third edition. strani 1-177, Blackwell Science.

Ustrezni deli standardov za gradbene konstrukcije Evrokod 0, Evrokod 1, Evrokod 2, Evrokod 6, Evrokod 7, Evrokod 8 (SIST EN 1990, SIST EN 1991-1, SIST EN 1991-1-3, SIST EN 1991-1-4, SIST EN 1992-1-1, SIST EN 1992-1-2, SIST EN 1996-1-1, SIST EN 1997-1-1, SIST EN 1998-1).

Lopatič J. 2015, Študijsko gradivo za predmet Masivni objekti (110 strani), UL FGG.

**Cilji in kompetence:**

Cilji:

- spoznati temeljna načela snovanja in izvedbe varnih, trajnih ter gospodarnih betonskih in zidanih konstrukcij,
- spoznati možnosti, prednosti in slabosti različnih nosilnih konstrukcij masivnih objektov.

Predmetnospecifične kompetence:

- obvladovanje osnovnih znanj za vodenje gradnje masivnih objektov,
- obvladovanje osnovnih znanj za snovanje ter projektiranje enostavnih masivnih konstrukcij.

**Objectives and competences:**

Objectives:

- to learn the main principles of conceptual design, design and executing safe, durable and economic concrete and masonry structures,
- to learn about the possibilities, advantages and disadvantages of different structural systems of concrete and masonry buildings.

Competences:

- mastering basic knowledge for managing the construction of concrete and masonry buildings,
- mastering basic knowledge for design of simple concrete and masonry structures.

**Predvideni študijski rezultati:**

Študent

**Intended learning outcomes:**

Student

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>- bo sposoben uporabiti postopke modeliranja, dimenzioniranja in konstruiranja na praktičnih primerih enostavnih betonskih in zidanih konstrukcijah,</li> <li>- bo sposoben uporabiti programsko opremo za analizo in izdelavo izvedbenih načrtov masivnih konstrukcij,</li> <li>- bo sposoben presojati o primernosti različnih materialov in tehnologij gradnje za graditev konkretnih objektov ter o ustreznosti izbranega načina modeliranja, dimenzioniranja in konstrukcijske izvedbe nosilne konstrukcije,</li> <li>- bo sposoben uporabiti strokovno literaturo in programsko opremo,</li> <li>- bo sposoben identificirati kritična mesta (priključki, vozlišča, šibka mesta ...) nosilnih konstrukcij in prepoznati stopnje zahtevnosti objekta v pogledu projektiranja in izvedbe,</li> <li>- bo sposoben dela v timu in sinteze znanja pridobljenega pri predhodnih predmetih.</li> </ul> | <ul style="list-style-type: none"> <li>- will be able to use the procedures of modelling and design in practical cases of simple concrete and masonry structures,</li> <li>- will be able to use software for the analysis and elaboration of technical drawings for concrete and masonry structures,</li> <li>- will be able to assess the adequacy of different materials and construction technologies for the construction of buildings and the adequacy of the selected modelling, conceptual design, design and construction method,</li> <li>- will be able to use professional literature and software,</li> <li>- will be able to identify critical spots (joints, nodes, weak points, etc.) of load-bearing structures, recognise the level of complexity of a building related to the design and execution,</li> <li>- will be able to work in teams and make a synthesis of the knowledge acquired from previous courses.</li> </ul> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Metode poučevanja in učenja:****Learning and teaching methods:**

|                              |                                       |
|------------------------------|---------------------------------------|
| Predavanja in računske vaje. | Lectures and computational tutorials. |
|------------------------------|---------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                       |         |                            |
|-----------------------|---------|----------------------------|
| Vaje                  | 30,00 % | Tutorials                  |
| Računski del izpita   | 35,00 % | Computational part of exam |
| Teoretični del izpita | 35,00 % | Theoretical part of exam   |

**Reference nosilca/Lecturer's references:**

LOPATIČ, Jože, SAJE, Drago, SAJE, Franc. Non-linear analysis of time-dependent response of concrete structures. International journal for engineering modelling, ISSN 1330-1365, 2010, letn. 23, št. 1/4, str. 1-11.

LOPATIČ, Jože. Vpliv dolgotrajnih visokih nivojev napetosti na tlačno trdnost betona = Influence of sustainable high stress levels on compressive strength of concrete. Gradbeni vestnik, ISSN 0017-2774, april 2003, let. 52, str. 74-80.

SAJE, Drago, LOPATIČ, Jože. The effect of constituent materials on the time development of the compressive strength of high-strength concrete. Magazine of Concrete Research, ISSN 0024-9831, 2010, letn. 62, št. 4, str. 291-300.

KRAUBERGER, Nana, BRATINA, Sebastjan, SAJE, Miran, SCHNABL, Simon, PLANINC, Igor. Inelastic buckling load of a locally weakened reinforced concrete column. Engineering structures, ISSN 0141-0296. [Print ed.], 2012, letn. 34, št. 1, str. 278-288.

MARKOVIČ, Mojca, SAJE, Miran, PLANINC, Igor, BRATINA, Sebastjan. On strain softening in finite element analysis of RC planar frames subjected to fire. Engineering structures, ISSN 0141-0296. [Print ed.], dec. 2012, letn. 45, str. 349-361

MARKOVIČ, Mojca, KRAUBERGER, Nana, SAJE, Miran, PLANINC, Igor, BRATINA, Sebastjan. Non-linear analysis of pre-tensioned concrete planar beams. Engineering structures, ISSN 0141-0296. [Print ed.], jan. 2013, letn. 46, str. 279-293.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|               |                                                          |
|---------------|----------------------------------------------------------|
| Predmet:      |                                                          |
|               | <b>ORGANIZACIJA IN VODENJE GRADBENIH DEL</b>             |
| Course title: |                                                          |
|               | <b>ORGANISATION AND MANAGEMENT OF CONSTRUCTION WORKS</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 3. letnik | Zimski   |

|                                                     |      |
|-----------------------------------------------------|------|
| Univerzitetna koda predmeta/University course code: | 1144 |
|-----------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 45         | 0       | 45   | 0             | 0                    | 90              | 6    |

|                            |              |
|----------------------------|--------------|
| Nosilec predmeta/Lecturer: | Robert Klinc |
|----------------------------|--------------|

|                             |                                           |
|-----------------------------|-------------------------------------------|
| Vrsta predmeta/Course type: | Obvezni strokovni/Obligatory professional |
|-----------------------------|-------------------------------------------|

|                   |                      |             |
|-------------------|----------------------|-------------|
| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|                   | Vaje/Tutorial:       | Slovenščina |

|                                                                       |                |
|-----------------------------------------------------------------------|----------------|
| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites: |
|                                                                       |                |

| Vsebina:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Content (Syllabus outline):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temeljni pojmi s področja organizacije; zgodovina in razvoj organizacije; proizvodni faktorji, produktivnost in ekonomičnost gradnje; oblikovanje tehnološkega procesa, osnove normiranja in plačevanja dela; osnove zagotavljanja kakovosti v gradbeni proizvodnji, industrializacija gradbeništva; projekt organizacije gradnje; predhodna preučevanja, pripravljala dela, ureditev gradbišča, dimenzioniranje elementov gradbišča; poslovanje na gradbišču ; organizacija vzdrževanja in prenove gradbenih objektov - načela planiranja in vodenja, | Fundamental concepts and definitions History and development of organisation; production factors, productivity, economics of construction; technological process design, fundamentals of norms and work payment; quality assurance fundamentals, industrialisation of construction; organisation of construction, preliminary investigations, preparation works, preparation of site, design of site elements; construction site administration Maintenance and refurbishment organisation; fundamentals of project planning and |

|                                                                                  |                                                                                             |
|----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| statični plani, terminski plani (gantogramsko, ciklogramsko, mrežno planiranje). | management; planning, scheduling techniques (gantograms, cyclograms, critical path method). |
|----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|

**Temeljna literatura in viri/Readings:**

Izbrana poglavja iz:

Rodošek, E. (1998). Osnove organizacije v gradbeništvu (1. natis). Fakulteta za gradbeništvo in geodezijo.

Rodošek, E. (1985). Operativno planiranje. Fakulteta za arhitekturo, gradbeništvo in geodezijo.

Pšunder, M. (2011). Operativno planiranje (2. dopolnjena izd.). Fakulteta za gradbeništvo.

Aktualna zakonodaja in predpisi s področja gradnje.

**Cilji in kompetence:**

Cilji:

- seznaniti študente z osnovami organizacije dela ter njihovo uporabo v gradbeništvu,
- spoznati povezavo in razmejitve tehnoloških in organizacijskih ukrepov, pomen organizacije v procesu graditve objektov, osnove študija časa in dela ter osvojijo znanje o kontinuiranosti oblikovanja in vodenja del od zasnove do uporabe objekta,
- seznaniti z osnovami poslovanja na gradbišču in v gradbenem podjetju.

Predmetnospecifične kompetence:

- pridobitev osnovnih znanj, potrebnih za izvajanje predmetov na operativni smeri v višjem letniku,
- sposobnost povezovati znanja s področja organizacije in tehnologije,
- pridobitev osnovnih veščin za pripravo ter vodenje del na gradbišču.

**Objectives and competences:**

Objectives:

- to familiarize students with fundamentals of organisation and their application in construction,
- to learn how to link and divide technological and organisational measures, the importance of organisation in construction process, fundamentals of work and time motion studies, and acquire knowledge on preparation and management of works from conceptual design to use of the structure,
- to acquaint students with basics of site management, as well as management at the company level.

Competences:

- acquisition of fundamental knowledge required to follow the courses in subsequent study years,
- ability to connect knowledge from the field of organisation and technology,
- acquisition of fundamental skills for the preparation and management of site works.

**Predvideni študijski rezultati:**

Študent

- bo sposoben organizirati delo na projektu v gradbenem podjetju, upoštevajoč pri tem različne faze gradbenega projekta, splošne značilnosti poslovanja na gradbišču in poznavanje metod študija in časa, normiranja in plačevanja dela, ter osnov operativnega planiranja,

**Intended learning outcomes:**

Student

- will be able to organise work on the project in construction company, taking into account different construction project phases, construction site management and knowledge of time and motion studies, knowing basics of work norms and work payment fundamentals, and basics of operational planning,

|                                                                                                                           |                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| - bo sposoben kritično presojati odločitve v gradbeni praksi,                                                             | - will be able to use the acquired knowledge directly in practice,                                                                                 |
| - bo sposoben uporabljati domačo in tujo literaturo s tega področja in povezovati vsebine iz različnih področij v celoto. | - will be able to use Slovene and foreign literature from the field of construction management and interconnect the contents from different areas. |

**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                            |                                                   |
|--------------------------------------------|---------------------------------------------------|
| Predavanja in vaje na konkretnih primerih. | Lectures, tutorial (includes practical examples). |
|--------------------------------------------|---------------------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                                                        |         |                                                     |
|--------------------------------------------------------|---------|-----------------------------------------------------|
| Računski del izpita ali 2 pozitivno ocenjena kolokvija | 50,00 % | Practical part of exam or 2 positive mid-term exams |
| Teoretični del izpita                                  | 50,00 % | Theoretical part of exam                            |

**Reference nosilca/Lecturer's references:**

TURK, Žiga, KLINC, Robert. A social-product-process framework for construction. Building research and information. 2020, letn. 48, št. 7, str. 747-762, ilustr. ISSN 0961-3218.

<https://www.tandfonline.com/doi/full/10.1080/09613218.2019.1691487>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=114374&lang=slv>, DOI: 10.1080/09613218.2019.1691487.

KLINC, Robert, TURK, Žiga. Construction 4.0 - digital transformation of one of the oldest industries. Economic and business review. 2019, vol. 21, no. 3, str. 393-410, ilustr. ISSN 1580-0466.

[http://ojs.ebrjournal.net/ojs/index.php/eb/article/view/786/pdf\\_163](http://ojs.ebrjournal.net/ojs/index.php/eb/article/view/786/pdf_163), <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=114085&lang=slv>, DOI: 10.15458/eb.92.

KLINC, Robert, TURK, Žiga, DOLENC, Matevž. Raziskava o rabi informacijsko - komunikacijskih tehnologij v slovenski gradbeni industriji = Survey of the information and communication technologies usage in Slovenian AEC industry. Gradbeni vestnik : glasilo Zveze društev gradbenih inženirjev in tehnikov Slovenije. [Tiskana izd.]. nov. 2010, letn. 59, str. 269-276, ilustr. ISSN 0017-2774.

GERMOVNIK, Neža, SNEDIC, Anka, FORTUNA, Barbara, KLINC, Robert. Stanje na področju elektronskih vlog za izdajo gradbenega dovoljenja v Sloveniji = Current situation on the field of electronic applications for the issuing of building permits in Slovenia. Gradbeni vestnik : glasilo Zveze društev gradbenih inženirjev in tehnikov Slovenije. [Tiskana izd.]. avg. 2014, letn. 63, str. 188-192, ilustr. ISSN 0017-2774.

KLINC, Robert, DOLENC, Matevž, TURK, Žiga. Engineering communication - current view on past and future. V: DIKBAŞ, Attila (ur.). Managing IT in construction /managing construction for tomorrow : proceedings of the 26th International Conference on IT in Construction & 1st International Conference on Managing Construction for tomorrow, Istanbul Technical University, Istanbul, Turkey, 1-3 October 2009. 26th International Conference on IT in Construction & 1st International Conference on Managing Construction for Tomorrow, Istanbul Technical University, Istanbul, Turkey, 1-3 October 2009. Boca Raton [etc.]: CRC, 2009. Str. 113-120, ilustr. ISBN 978-0-415-56744-2, ISBN 0-415-56744-0.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                         |
|----------------------|-----------------------------------------|
| <b>Predmet:</b>      |                                         |
|                      | <b>OSNOVE JEKLENIH KONSTRUKCIJ</b>      |
| <b>Course title:</b> |                                         |
|                      | <b>FUNDAMENTALS OF STEEL STRUCTURES</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 3. letnik | Zimski   |

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|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1546 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 45         | 15      | 45   | 0             | 0                    | 105             | 7    |

|                                   |                           |
|-----------------------------------|---------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Jože Korelc, Leon Hladnik |
|-----------------------------------|---------------------------|

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| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni/Obligatory professional |
|------------------------------------|-------------------------------------------|

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|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

|                                                                              |                                         |
|------------------------------------------------------------------------------|-----------------------------------------|
| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b>                   |
| Opravljen izpit pri predmetu Trdnost.                                        | Passed exam from Strength of materials. |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Mesto in vloga jekla kot gradbenega materiala v slovenskem in svetovnem merilu. Mehanske lastnosti jekla. Standardne kvalitete, označevanje in izbira kvalitete jekla. Tehnološki postopki obdelave jekla. Vrste, tehnologija izdelave in standardni asortiman jeklenih polizdelkov. Izdelava in montaža jeklenih konstrukcij. Koncepti projektiranja jeklenih konstrukcij. Veljavni standardi in pravilniki za analizo in dimenzioniranje jeklenih konstrukcij. Modeliranje in globalna analiza jeklenih konstrukcij. Programska podpora analizi in projektiranju jeklenih konstrukcij. Protipožarna in protikorozijska zaščita jeklenih | Place and role of steel as a building material in Slovenia and on a global scale. Mechanical properties of steel. Standard grades, labelling and choice of steel grade. Technological manufacturing processes of steel elements/structures. Types and methods of manufacturing and standard assortment of semi-finished steel elements. Manufacturing and assembly of steel structures. Design concepts of steel structures. Standards and regulations for the analysis and the design of steel structures. Modelling and global analysis of steel structures. Computer aided design of steel structures. Fire and corrosion |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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| konstrukcij. Vezna sredstva in spoji (zvari, vijaki, zakovice, čepi). Enostavni spoji v natezno, tlačno in upogibno obremenjenih konstrukcijskih elementih. Osnovna načela stabilnosti konstrukcij (uklon tlačnih palic, bočna zvrnitev upogibnih nosilcev, lokalno izbočenje pločevin). Pojem kompaktnosti in razvrstitev prečnih prereзов po kompaktnosti. Nosilnost prečnih prereзов na tlak, nateg, strig in upogib. Nosilnost osnovnih elementov jeklene konstrukcije (tlačene palice, natezne palice in vrvi, upogibni nosilci, tlačno in upogibno obremenjeni nosilci). | protection of steel structures. Fasteners (welds, screws, rivets, studs). Basic connections of structural elements in tension, compression and bending. Basic principles of stability (flexural buckling of columns, lateral – torsional buckling of beams, local buckling of slender plates). Cross-section classification as a function of plate slenderness. Bearing capacity of cross-sections loaded in axial compression, tension, shear and bending. Bearing resistance of basic steel structural elements (compression members, tension members, beams, members in bending and axial compression). |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Temeljna literatura in viri/Readings:**

Izbrana poglavja iz:

Kržič, F. 1994. Jeklene konstrukcije I. Ljubljana, UL FGG, 207 strani, poglavja 1 do 10.

Beg, D. Evrokod 3 : projektiranje jeklenih konstrukcij. V: Beg, D. (ur.), Pogačnik, A.(ur.). 2009. Priročnik za projektiranje gradbenih konstrukcij po evrokod standardih. Ljubljana, Inženirska zbornica Slovenije, str. 3.1-3.152.

European Steel Design Education Programme (ESDEP). Dostopno na: [www.fgg.uni-lj.si/kmk/](http://www.fgg.uni-lj.si/kmk/).

Študijsko gradivo. Dostopno na: [www.fgg.uni-lj.si/kmk/](http://www.fgg.uni-lj.si/kmk/).

**Cilji in kompetence:****Objectives and competences:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| <p>Cilji:</p> <ul style="list-style-type: none"> <li>- pridobiti praktična in teoretična znanja, ki omogočajo študentu projektiranje enostavnih jeklenih konstrukcijskih elementov.</li> </ul> <p>Predmetnospecifične kompetence:</p> <ul style="list-style-type: none"> <li>- poznavanje in razumevanje tehnoloških postopkov izdelave in montaže jeklenih konstrukcij,</li> <li>- obvladovanje mejnega stanja osnovnih konstrukcijskih elementov jeklenih konstrukcij,</li> <li>- osvojitve osnovnih postopkov projektiranja in ustreznih predpisov za projektiranje in gradnjo jeklenih konstrukcij.</li> </ul> | <p>Objectives:</p> <ul style="list-style-type: none"> <li>- to gain practical and theoretical knowledge that allows the design of simple steel structures.</li> </ul> <p>Competences:</p> <ul style="list-style-type: none"> <li>- knowledge and understanding of the technological manufacturing processes and the assembly of steel structures,</li> <li>- understanding of the ultimate limit state of basic structural steel elements,</li> <li>- understanding the design process and regulations for the design and construction of steel structures.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                               |                                                                                                                                                                                                                                |
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| <p>Študent</p> <ul style="list-style-type: none"> <li>- bo sposoben konstruirati in dimenzionirati vse običajne vrste vijačnih in varjenih spojev,</li> </ul> | <p>Student</p> <ul style="list-style-type: none"> <li>- will be able to construct and design all basic types of steel joints,</li> <li>- will be able to understand, construct and design the basic steel elements,</li> </ul> |
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| <ul style="list-style-type: none"> <li>- bo sposoben enostavnega konstruiranja in dimenzioniranja konstrukcijskih elementov jeklenih konstrukcij,</li> <li>- bo sposoben izdelati projekt za enostavne jeklene konstrukcije ter voditi in nadzorovati gradnjo jeklene konstrukcije, kar je ena od temeljnih nalog inženirske prakse,</li> <li>- bo sposoben kritične presoje posameznega problema, izločitve neustreznih rešitev in utemeljene izbire ene od ustreznih rešitev.</li> </ul> | <ul style="list-style-type: none"> <li>- will be able to design project and to manage construction of steel buildings and its supervision which is fundamental task of engineering practice,</li> <li>- will be able to critically judge individual problem, to eliminate inappropriate solutions and to justify the choice of possible solution.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

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|--------------------------------------------------------|--------------------------------------------------------------|
| Predmet se izvaja v obliki predavanj in računskih vaj. | The course consists of lectures and computational exercises. |
|--------------------------------------------------------|--------------------------------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                                   |         |                          |
|-----------------------------------|---------|--------------------------|
| Pravilno izdelane in urejene vaje | 10,00 % | Properly made exercises  |
| Teoretični del izpita             | 50,00 % | Theoretical part of exam |
| Računski del izpita               | 40,00 % | Practical part of exam   |

**Reference nosilca/Lecturer's references:**

BEG, Darko, HLADNIK, Leon. Zaostale napetosti pri mikrolegiranih jeklih visoke trdnosti. Gradbeni vestnik, ISSN 0017-2774, 1993, let. 42, št. 11/12, str.267-275.

BEG, Darko, HLADNIK, Leon. Eigenspannungen bei geschweissten I-Profilen aus hochfesten Stählen. Der Stahlbau, ISSN 0038-9145, 1994, jr. 63, h. 5, str. 134-139.

BEG, Darko, HLADNIK, Leon. Numerična analiza lokalne stabilnosti varjenih nosilcev, narejenih iz jekel visoke trdnosti. Gradbeni vestnik, ISSN 0017-2774, 1995, 44, št. 9/10, str. 217-223.

BEG, Darko, HLADNIK, Leon. Experimentalna analiza lokalne stabilnosti varjenih nosilcev, narejenih iz jekel visoke trdnosti. Gradbeni vestnik, ISSN 0017-2774, 1996, let. 45, št. 1/2, str. 27-34.

BEG, Darko, HLADNIK, Leon. Eksperimentalna analiza lokalne stabilnosti varjenih I nosilcev, narejenih iz jekel visoke trdnosti. Gradbeni vestnik, ISSN 0017-2774, januar-februar 1996, let. 45, št. 1/2, str. 27-34.

BEG, Darko, HLADNIK, Leon. Slenderness limit of class 3 I cross - sections made of high strength steel. Journal of Constructional Steel Research, ISSN 0143-974X. [Print ed.], 1996, vol. 38, no. 3, str. 201-217. ;

KORELC, Jože, STUPKIEWICZ, Stanisław. Closed-form matrix exponential and its application in finite-strain plasticity. International journal for numerical methods in engineering, ISSN 0029-5981, 2014, letn. 98, št. 13, str. 960-987, ilustr., doi: 10.1002/nme.4653.

MELINK, Teja, KORELC, Jože. Stability of Karhunen- Loeve expansion for the simulation of Gaussian stochastic fields using Galerkin scheme. Probabilistic Engineering Mechanics, ISSN 0266-8920. [Print ed.], jul. 2014, letn. 37, str. 7-15, ilustr., doi: 10.1016/j.probengmech.2014.03.006. KORELC, Jože. Semi-analytical solution of path-independed nonlinear finite element models. Finite elements in analysis and design, ISSN 0168-874X. [Print ed.], 2011, letn. 47, št. 3, str. 281-287, graf. prikazi.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                |
|----------------------|--------------------------------|
| <b>Predmet:</b>      |                                |
|                      | <b>TEHNOLOŠKI PROCESI</b>      |
| <b>Course title:</b> |                                |
|                      | <b>TECHNOLOGICAL PROCESSES</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 3. letnik | Zimski   |

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|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1545 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 45   | 0             | 0                    | 75              | 5    |

|                                   |                                  |
|-----------------------------------|----------------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Andrej Kryžanowski, Igor Planinc |
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| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni /Obligatory professional |
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| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

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| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b> |
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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Zgodovinski pregled razvoja tehnologij; pregled sodobnih tehnoloških procesov, trajnostnih tehnoloških rešitev in pomen analize življenjskega cikla pri tehnoloških procesih v gradbeništvu; tehnološki procesi zemeljskih del: pripravljala dela (čiščenje terena, geološke-geomehanske raziskave, geodetska izmera); gradbena jama (način izvedbe, transporti, nasipi, izkopi, načini zavarovanja gradbene jame ...); način izvedbe temeljenja objektov (plitko, globoko temeljenje ...); način izvedbe nasipov in izkopov; tehnološki procesi zidarskih del: tipi osnovnih zidanih konstrukcij, | Historical background of development of technologies; overview of contemporary technological processes, sustainable technological solutions and the importance of life cycle analysis in technological processes in civil engineering; technological processes of earthmoving work: site preparation works (site-clearance work, geological and geomechanical surveying, geodetic surveying); construction pit (type of execution, transport, earthworks, excavation, ways of securing the construction pit, etc.); structure foundation design (shallow, deep, etc.); types of earthworks and |

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| <p>dimenzioniranje malt, zidanje (priprava gradbišča, priprava malte, pomožna dela ...); izdelava ometov (priprava gradbišča, klasični, strojni); tehnološki procesi armiranobetonskih del: projekt betona (osnove projektiranja betona, odri in opaži, opažni načrt); vgrajevanje betona (zunanji in notranji transporti betona, standardni postopki vgradnje betona, betoniranje pri nizkih in visokih temperaturah, nega betona ...); polaganje armature (priprava materiala, vgradnja na gradbišču ...); tehnološki procesi osnovnih montažnih del: področja uporabe prefabrikatov v gradbeništvu, suhi-mokri montažni postopki; proizvodni obrati v gradbeništvu: obrati za proizvodnjo in predelavo materialov (kamnolomi, separacije, drobilnice, betonarne, železokrivnice, mizarsko-tesarski obrati), pomožni obrati (strojni), obrati za obrtniška dela (fasaderski, slikopleskarski ...), proizvodni obrati za montažne elemente (konstrukcijski elementi, galanterija ...); asfaltne baze; zagotavljanje in spremljanje kakovosti gradnje v vseh projektnih fazah; tehnologije specialnih betonov; opredelitve tipov specialnih betonov (masivni, abrazijsko odporni, mikroarmirani, visokotrdni, valjani ...), projektiranje specialnih betonov, možnosti in način uporabe specialnih betonov; tehnologije zahtevnih opažnih in podpornih sistemov; opredelitve tipov opažev s podporno konstrukcijo (tradicionalni, kovinski, prenosni, tunelski ...), osnove dimenzioniranja opažne konstrukcije, način gradnje opažnih konstrukcij s primeri iz prakse (pregrade, mostovi ...); uporaba mehanizacije v in opreme pri organizaciji tehnoloških procesov gradbeništvu.</p> <p>Seminarska naloga:</p> <ul style="list-style-type: none"> <li>- izdelava tehnoloških projektov priprave gradnje,</li> <li>- izdelava tehnoloških projektov gradnje za primer uporabe različnih tipov vgradnih materialov,</li> <li>- izdelava analize življenjskega cikla za analizo vplivov na okolje pri tehnoloških projektih priprave in gradnje objektov.</li> </ul> | <p>excavations; technological processes of masonry and bricklaying work: types of basic masonry structures, dimensioning of mortars and grouts, bricklaying (site preparation works, grout preparation, ancillary works, etc.); renderings (site preparation works, classical, mechanical); technological processes of reinforced-concrete work: concrete design project (fundamentals of concrete design, scaffolding, shuttering, formwork design); concrete placement (transport of concrete, standard placement procedures, placing concrete in low and high temperatures, curing, etc.); reinforcement laying (preparation of material, installation on the site, etc.); technological processes of basic assembly works: prefabricated units and elements in construction, dry/wet assembly procedures; production plants in civil engineering construction: plants for production and processing of materials (quarries, separation plants, crushing plants, concrete mixing plants, iron bending facilities, carpentry and joinery facilities), auxiliary plants (mechanical), finishing works (plastering, painting, etc.), production plants for prefabricated units (structure elements, ironmongery etc.); asphalt bases; provision and monitoring of construction quality in all project stages; technologies of special types of concrete; types of concrete (massive, wear resistant, micro-reinforced, high-performance, roller compacted, etc.), design of special types of concrete, possibilities and ways of use; technologies of complex formwork and support systems; definition of types of formwork with support structures (traditional, metal, transportable, tunnel form etc.), fundamentals of formwork dimensioning, ways of formwork assembly with practical cases (dams, bridges, etc.); use of machinery and equipment in organisation of technological processes in construction.</p> <p>Seminar work:</p> <ul style="list-style-type: none"> <li>- elaboration of technological projects of construction preparation,</li> <li>- elaboration of technological construction projects by using various types of installation materials,</li> <li>- elaboration of a life cycle analysis for the analysis of environmental impacts in technological projects for the preparation and construction of buildings.</li> </ul> |
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### Temeljna literatura in viri/Readings:

- Trbojević, B. 1981. Organizacija gradjevinskih radova. Beograd, GK.
- Trbojević, B. 1988. Građevinske mašine. Beograd, GK.
- Mehta P. K. and P. J. M. 2006. Monteiro, Concrete: microstructures, properties and materials, 3th edition. New York, McGraw.Hill, strani: 3-21, 121-202, 281-316, 317-340, 341-386, 449-558.
- Herbert L. Nichols, Jr. and David A. Day. 2005. Moving the Earth, 5th edition. McGraw-Hill, strani 4.1-4.35 in 5.1-5.63.
- Gojković, M. 1988. Oplate i skele, Naučna knjiga Beograd.
- Vivian T. and Khoa N. Le., 2019. Sustainable Construction Technologies – LCA, Elsevier, Oxford.
- Ayodeji, O., Clinton, A., Seyi, S., Wellington, T. 2022. Sustainable Construction in the Era of the Fourth Industrial Revolution, Routledge, Oxon.
- Ayodeji, O. and Clinton A. 2017. Sustainable Value Management for Construction Projects, Springer, Johannesburg.
- Kryžanowski, A. 2014 Tehnologija - predstavitev s predavanj, Interno gradivo, 750 strani.

**Cilji in kompetence:****Objectives and competences:****Cilji:**

- spoznati osnovne koncepte za projektiranje in izvedbo osnovnih in del specialnih tehnoloških procesov pri gradbenih konstrukcijah,
- naučiti se izdelave osnovnih tehnoloških projektov v pripravljalni fazi ter upravljanje osnovnih tehnoloških procesov med gradnjo,
- spoznati osnovni koncept opredelitve analize življenjskega cikla pri posameznih tehnoloških procesih v gradbeništvu.

**Predmetnospecifične kompetence:**

- povezovanja znanja s področja tehnologij gradenj, teorije gradbenih konstrukcij in organizacije ter vodenja gradnje gradbenih objektov,
- izdelovanje preprostih tehnoloških projektov, kot so: projekt betona, opažni načrt in podobno,
- izdelava analize vplivov na okolje posameznega tehnološkega procesa za potrebe presoje vplivov na okolje nameravanega posega v okolje in prostor.

**Objectives:**

- to learn about the basic concepts of design and execution of basic and partially specific technological processes in building structures,
- to learn to elaborate basic technological design projects in the preparation stage, and management of basic technological processes during construction,
- to learn the basic concept of defining life cycle analysis for individual technological processes in civil engineering.

**Competences:**

- integration of knowledge in building technologies, building structure theory, and construction organisation and management,
- elaboration of simple technological projects, such as concrete design project, formwork design, and similar,
- elaboration of an environmental impact analysis of a specific technological process for the purpose of the environmental impact assessment of the intended intervention in the environment and space.

**Predvideni študijski rezultati:****Intended learning outcomes:****Študent**

- bo sposoben povezovati znanja s področja tehnologij gradenj, teorije gradbenih konstrukcij in

**Student**

- will be able to integrate knowledge in building technologies, building structure theory, and

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| <p>organizacije ter vodenja gradnje gradbenih objektov in izdelati preprost tehnološki projekt,</p> <ul style="list-style-type: none"> <li>- bo sposoben vzpostaviti relacije in povezave med posameznimi tehnološkimi procesi v gradbeništvu, upoštevajoč pri tem različne lastnosti gradbenih materialov in gradbenih konstrukcij,</li> <li>- bo sposoben uporabiti znanje pri načrtovanju optimalne organizacije gradnje, tehnološki pripravi gradnje in projektiranju gradbenih konstrukcij,</li> <li>- bo sposoben povezovati znanja s področja tehnologije gradenj in njihovega vpliva na okolje v običajnih fazah življenjskega cikla.</li> </ul> | <p>construction organisation and management and to elaborate a simple technological project,</p> <ul style="list-style-type: none"> <li>- will be able to establish the relationship and integration between various technological processes in construction, taking into account different characteristics and performance of building materials and building structures,</li> <li>- will be able to apply knowledge in the field of the planning of optimum organisation of building and technological preparation for construction and structural design,</li> <li>- will be able to integrate knowledge in the field of construction technology and its impact on the environment in the normal phases of its life cycle.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                                                                                                          |                                                                                                                                                                  |
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| Izdelava individualne seminarske naloge na izbrano temo z zagovorom. Izdelava računskih vaj s praktičnimi primeri iz prakse. Ekskurzija. | Elaboration of individual seminar work on a selected topic, including defence of the work. Elaboration of calculation exercises with practical cases. Excursion. |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                                           |         |                                                       |
|-------------------------------------------|---------|-------------------------------------------------------|
| Izdelava seminarske naloge                | 40,00 % | Elaboration of seminar work                           |
| Pisni izpit (teoretični in praktični del) | 60,00 % | Written examination (theoretical and practical parts) |

**Reference nosilca/Lecturer's references:**

KRYŽANOWSKI, Andrej, MIKOŠ, Matjaž, ŠUŠTERŠIČ, Jakob, UKRAINCZYK, Velimir, PLANINC, Igor. Testing of concrete abrasion resistance in hydraulic structures on the lower Sava river. Stroj. vestn., apr. 2012, vol. 58, no. 4, str. 245-254.

KRYŽANOWSKI, Andrej, MIKOŠ, Matjaž, ŠUŠTERŠIČ, Jakob, PLANINC, Igor. Abrasion Resistance of Concrete in Hydraulic Structures. ACI mater. j., julij-avgust 2009, letn. 106, št. 4, str. 349-356, KRYŽANOWSKI, Andrej, SCHNABL, Simon, TURK, Goran, PLANINC, Igor. Exact slip-buckling analysis of two-layer composite columns. Int. j. solids struct.

MARKOVIČ, Mojca, KRAUBERGER, Nana, SAJE, Miran, PLANINC, Igor, BRATINA, Sebastjan. Non-linear analysis of pre-tensioned concrete planar beams. Eng. struct. [Print ed.], jan. 2013, letn. 46, str. 279-293, ilustr., doi: 10.1016/j.engstruct.2012.08.004.

KRYŽANOWSKI, Andrej, SAJE, Miran, PLANINC, Igor, ZUPAN, Dejan. Analytical solution for buckling of asymmetrically delaminated Reissner's elastic columns including transverse shear. Int. j. solids struct. [Print ed.], 2008, letn. 45, št. 3/4, str. 1051-1070.

KRYŽANOWSKI, A., MIKOŠ, M., PLANINC, I., ŠUŠTERŠIČ, J. (2008). Searching for an optimal technical solution and concrete mixture for erosion prevention in dam slides. Balkema - Proceedings and monographs in engineering, water and earth sciences. London, Taylor & Francis, 509-515.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                |
|----------------------|--------------------------------|
| <b>Predmet:</b>      |                                |
|                      | <b>PRAKTIČNO USPOSABLJANJE</b> |
| <b>Course title:</b> |                                |
|                      | <b>PRACTICAL TRAINING</b>      |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 3. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1145 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 6          | 0       | 0    | 0             | 160                  | 74              | 8    |

|                                   |                         |
|-----------------------------------|-------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Andreja Istenič Starčič |
|-----------------------------------|-------------------------|

|                                    |                                           |
|------------------------------------|-------------------------------------------|
| <b>Vrsta predmeta/Course type:</b> | Obvezni strokovni/Obligatory professional |
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|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

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| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b> |
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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                            |
| Študent se seznani in opravlja delo, ki ga opravlja diplomant tega študija v praksi. Še predvsem se: seznani z organizacijsko strukturo gradbenega podjetja; seznani se z aktualnim dogajanjem v gradbenem podjetju; dela na terenu – aktualnem gradbišču, oziroma v pisarni; opravi manj zahtevna dela na aktualnem projektu. | Student is introduced to performance of work done by graduate in practice, especially: learning about the organizational structure of a construction company; getting familiar with current developments in a construction company; field work - the current site, or in the office - less demanding work on current project. |

**Temeljna literatura in viri/Readings:**

Viri so izbrani v sodelovanju z mentorjem praktičnega usposabljanja glede na vsebine, ki so predpisane in z njimi razpolaga organizacija, ki izvaja praktično usposabljanje. /

Interna in druga gradiva v delovni organizaciji.

Smernice za praktično usposabljanje na Univerzi v Ljubljani, Ljubljana, september 2007, dostopno na spletu.

Govekar, Okoliš et.al. 2010. Praktično usposabljanje študentov v delovnih organizacijah in primeri dobrih praks. Ljubljana, UL FF, Center za pedagoško izobraževanje.

Učno gradivo v spletni učilnici.

**Cilji in kompetence:****Cilji:**

- spoznati operativno delo v ciljnih poklicih in organizacijsko strukturo subjektov na področju gradbeništva,
- motivirati študenta, da spozna dejavnike kariernega načrtovanja in razvoja in procese povezane s kariernim razvojem,
- omogočiti študentu samoevalvacijo kompetenc in dejavnikov, ki podpirajo procese poklicne identifikacije v povezavi akademskega okolja in delovnih okolij,
- spoznati značilnosti učenja na delovnem mestu in značilnosti delovnih okolij ter značilnosti opazovanja in registriranja delovnih procesov.

**Predmetnospecifične kompetence:**

- obvladovanje uporabe in prenosa teoretičnih znanj, ki jih študent pridobi med študijem pri predavanjih, vajah ter seminarjih, v gradbeniško prakso,
- sposobnost za povezovanje teorije in dela v praksi v splošnem.

**Objectives and competences:****Objectives:**

- to learn about the operational work in targeted occupations and organizational structure of entities in the construction field,
- to motivate student to learn about the elements of career planning and development and processes related to career development,
- to enable student self-evaluation of competencies and the factors that support the processes of professional identification in conjunction with academic environment and working environments,
- to learn about the characteristics of workplace learning, working environments and the characteristics of observation and registration during the work processes.

**Competences:**

- application and transfer of theoretical knowledge acquired by student during lectures, tutorials and seminars at the construction practices,
- ability to integrate theory and practical work in general.

**Predvideni študijski rezultati:****Študent**

- bo sposoben pridobiti in uporabiti praktične izkušnje in praktična znanja za področje nalog in storitev gradbene stroke, ki jih je pridobil na praksi,
- bo sposoben za prenos in uporabo znanj študijskih predmetov v delovnem okolju praktičnega usposabljanja,
- se bo sposoben soočiti z aktualnimi delovnimi nalogami oz. uporabi aktualna znanja in pripomočke

**Intended learning outcomes:****Student**

- will be able to acquire and use practical experience and practical knowledge, which has gained in practical training, in the field of tasks and services of construction field,
- will be able to apply and use knowledge of academic courses in the working environment of practical training,



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| <p>pri izpolnjevanju nalog, ki jih opravlja organizacija, v kateri poteka praktično usposabljanje,</p> <ul style="list-style-type: none"> <li>- bo sposoben sinteze pridobljenih znanj tekom študija v povezavi s praktičnimi izkušnjami v okolju praktičnega usposabljanja,</li> <li>- se bo sposoben po opravljeni praksi lažje in hitreje uvesti v delo po končanem študiju, razumeti različne gradbene subjekte in njihovo vlogo v družbi,</li> <li>- bo sposoben izdelati diplomsko nalogo v povezavi s praktičnimi problemi,</li> <li>- bo sposoben ovrednotiti svoje delo glede na zastavljene in dosežene cilje,</li> <li>- bo sposoben refleksije strokovnega dela na osnovi zbranih informacij,</li> <li>- bo sposoben, v povezavi s praktičnimi problemi, bolj kakovostno razumeti vsebine predmetov v študijskem procesu, tudi pri izdelavi diplomske naloge, kakor tudi kasneje pri uvajanju na delovno mesto,</li> <li>- bo sposoben za samostojno načrtovanje lastne kariere in za samoevalvacijo lastnega znanja in kompetenc,</li> <li>- bo razvijal splošne kompetence (komunikacija, timsko delo, projektno delo, reševanje problemov ...).</li> </ul> | <ul style="list-style-type: none"> <li>- will be able to deal with current tasks, use current knowledge and tools in fulfilling the tasks carried out by the organization in which the practical training is undertaken,</li> <li>- will be able to synthesize the knowledge acquired during the study in conjunction with practical experience in the environment of practical training,</li> <li>- will be able to practice carried out easily and quickly inducted after completing their studies, to understand the different construction entities and their role in society,</li> <li>- will be able to produce a thesis related to practical problems,</li> <li>- will be able to evaluate their work against the objectives and targets achieved,</li> <li>- will be able reflection of professional work on the basis of the information collected,</li> <li>- will be able, in conjunction with practical problems, higher quality understand the contents of objects in the study process, including in the manufacture of the thesis, as well as later in the introduction to the workplace,</li> <li>- will be able to independently design their own careers and their own self-assessment of knowledge and competences,</li> <li>- will develop general skills (communication, teamwork, project work, problem solving ...).</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

Terensko delo, mentorstvo, demonstracije, , pisanje in vodenje dnevnika in portfolia prakse.

Field work, mentoring, demonstrations, writing and managing diary and portfolio practices.

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                |         |                         |
|----------------|---------|-------------------------|
| Dnevnik prakse | 40,00 % | Diary of practical work |
| Portfolio      | 30,00 % | Portfolio               |
| Ustni zagovor  | 30,00 % | Oral presentation       |

**Reference nosilca/Lecturer's references:**

ISTENIČ STARČIČ, Andreja. Competence management system design in international multicultural environment : registration, transfer, recognition and transparency. Br. j. educ. technol. (Print), 2012, letn. 43, št. 4, str. 108-112.

MIKOŠ, Matjaž, JAKLIČ, Samo, ISTENIČ STARČIČ, Andreja. Statistično-demografska analiza praktikantov študentov geodezije v Sloveniji v obdobju 2008-2011 = Statistical and for planning his/her career and self-assessment of skills and competencies.demographic analysis of geodesy students apprentices in Slovenia in the period from 2008 to 2011. Geod. vestn.. [Tiskana izd.], sep. 2012, letn. 56, št. 3, str. 513-556, ilustr. Dostopno na: [http://www.geodetski-vestnik.com/56/3/gv56-3\\_534-556.pdf](http://www.geodetski-vestnik.com/56/3/gv56-3_534-556.pdf).

ISTENIČ STARČIČ, Andreja, TURK, Žiga. Slovenski študenti geodezije in informacijsko-komunikacijska tehnologija = Geodesy students in Slovenia and information & communication technology. Geod. vestn.. [Tiskana izd.], 2010, letn. 54, št. 1, str. 70-87, ilustr. Dostopno na: [http://www.geodetski-vestnik.com/54/1/gv54-1\\_070-087.pdf](http://www.geodetski-vestnik.com/54/1/gv54-1_070-087.pdf).

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                       |
|----------------------|-----------------------|
| <b>Predmet:</b>      |                       |
|                      | <b>DIPLOMSKO DELO</b> |
| <b>Course title:</b> |                       |
|                      | <b>DIPLOMA WORK</b>   |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik    | Semestri |
|---------------------------------------------------------------|---------------------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) | 3. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1538 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 0          | 0       | 0    | 0             | 150                  | 150             | 10   |

|                                   |  |
|-----------------------------------|--|
| <b>Nosilec predmeta/Lecturer:</b> |  |
|-----------------------------------|--|

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|------------------------------------|------------------------------------|
| <b>Vrsta predmeta/Course type:</b> | Obvezni splošni/Obligatory general |
|------------------------------------|------------------------------------|

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|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

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| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>                                                      | <b>Prerequisites:</b>                                                                                                                        |
| Odobrena tema in mentor s strani Študijskega odbora Oddelka za gradbeništvo skladno s Pravilnikom o študiju na I. in II. stopnji. | Approved topic and supervisor by the Study Board of the Department of Civil Engineering according to the Rules of 1st and 2nd cycle studies. |

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| <b>Vsebina:</b>                                                                                                                                                                                         | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                     |
| Diplomsko delo se izdelava pod mentorstvom izbranega učitelja. Delo se javno predstavi ob zaključku študija. Vsebovati mora:<br>- Uvod<br>- Delovno hipotezo<br>- Pregled virov<br>- Material in metode | Thesis is made under the supervision of a selected teacher. The work is presented in public at the end of the study. It must include:<br>- Introduction<br>- The working hypothesis<br>- Overview of sources<br>- Material and methods |

|                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                  |
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| <ul style="list-style-type: none"> <li>- Rezultate</li> <li>- Razpravo</li> <li>- Povzetek</li> </ul> <p>Praviloma se v nalogi obravnavajo praktični strokovni problemi ali raziskovalne in razvojne teme s področja gradbeništva ter podajajo rešitve, do katerih pridejo s pomočjo študija in izsledkov lastnega raziskovalnega dela.</p> | <ul style="list-style-type: none"> <li>- Results</li> <li>- Discussion</li> <li>- Summary</li> </ul> <p>The diploma will ordinarily deal with practical professional problems or research and development themes from the area of civil engineering that provide further solutions which come out from the study and from the results of students' own work.</p> |
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**Temeljna literatura in viri/Readings:**

Literatura s področja vsebine diplomskega dela.

T. Koler-Povh, G. Turk: Navodila za oblikovanje visokošolskih del na FGG in navajanje virov, FGG UL, Ljubljana, 2016, 39 strani, priloge. Dostopno na: <https://www.fgg.uni-lj.si/diplomske-naloge-in-magistrska-dela/>

Literature from the field of the contents of the thesis.

Instructions for creating higher part of the Faculty of Civil and Geodetic Engineering and citation of sources.

**Cilji in kompetence:****Objectives and competences:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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| <p>Cilji</p> <ul style="list-style-type: none"> <li>- uporabiti pridobljena znanja v širši strokovni ali razvojni nalogi, skladni z odobreno temo diplomske naloge.</li> </ul> <p>Predmetnospecifične kompetence</p> <ul style="list-style-type: none"> <li>- sposobnost izdelati koncept naloge, v kateri so opredeljeni namen, cilji, metode in viri za izdelavo naloge</li> <li>- sposobnost pisnega izražanja v slovenskem jeziku s smiselno uporabo strokovne terminologije</li> <li>- sposobnost samostojnega, kritičnega in etičnega načina dela ter sinteza v okviru študija pridobljenih znanj</li> <li>- sposobnost razvijanje komunikacijske spretnosti in sposobnosti.</li> </ul> | <p>Objectives</p> <ul style="list-style-type: none"> <li>- to use the knowledge gained in an in-depth study on the topic of the thesis.</li> </ul> <p>Competences</p> <ul style="list-style-type: none"> <li>- ability to prepare a concept, where the purposes, goals, methods and references for the thesis are presented</li> <li>- ability of written expression in Slovene language with sensible use of professional terminology.</li> <li>- ability to develop independent, critical and ethical way of working and a synthesis of knowledge obtained during the study</li> <li>- ability to develop communication skills and abilities.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                               |                                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Študent</p> <ul style="list-style-type: none"> <li>- bo sposoben prenesti znanja iz teoretičnega dela šolanja v reševanje konkretnih problemov.</li> </ul> | <p>Student</p> <ul style="list-style-type: none"> <li>- will be able to transfer knowledge from theoretical part of education to solving concrete problems</li> </ul> |
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|                                                                                                          |                                                                                                           |
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| - bo sposoben povezovanja znanj in spretnosti pri strokovnem ali razvojnem delu.                         | - will be able to connect knowledge and skills in professional or development work                        |
| - bo sposoben sintetizirati znanja, razvijati komunikacijske spretnosti in samostojno nadgraditi znanja. | - will be able to synthesize of knowledge, develop communication skills and upgrade skills independently. |

**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                   |                                     |
|-----------------------------------|-------------------------------------|
| Mentorsko vodeno samostojno delo. | Independent work under supervision. |
|-----------------------------------|-------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|               |         |                 |
|---------------|---------|-----------------|
| Pisni izdelek | 50,00 % | Written product |
| Zagovor       | 50,00 % | Defence         |

**Reference nosilca/Lecturer's references:**

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## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                      |
|----------------------|--------------------------------------|
| <b>Predmet:</b>      |                                      |
|                      | <b>POŽARNA ODPORNOST KONSTRUKCIJ</b> |
| <b>Course title:</b> |                                      |
|                      | <b>FIRE RESISTANCE OF STRUCTURES</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik | Semestri      |
|---------------------------------------------------------------|---------------------------------|--------|---------------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) |        | Letni, Zimski |

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|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1270 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 45         | 0       | 30   | 0             | 0                    | 75              | 5    |

|                                   |              |
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| <b>Nosilec predmeta/Lecturer:</b> | Tomaž Hozjan |
|-----------------------------------|--------------|

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|------------------------------------|-----------------------------------------|
| <b>Vrsta predmeta/Course type:</b> | Izbirni strokovni/Elective professional |
|------------------------------------|-----------------------------------------|

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|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

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| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b> |
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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <p>Splošno o požarnem inženirstvu. Pregled osnovnih pojmov. EU gradbeni standardi in predpisi. Požarna obtežba. Modeli standardnih in realnih požarov. Ukrepi aktivne požarne zaščite. Evakuacijske poti. Ukrepi pasivne požarne zaščite. Vpliv visoke temperature na lastnosti konstrukcijskih materialov.</p> <p>Določitev časovnega in krajevnega poteka temperature po konstrukciji. Posebnosti pri različnih materialih in tipih konstrukcij. Računsko ugotavljanje požarne odpornosti nosilnih konstrukcij skladno s standardi Evrokod.</p> | <p>Introduction to fire engineering. Overview of basic terms. EU engineering standards and regulations. Fire load. Models of standard and real fires. Active and passive actions of fire protection. Evacuation routes. Influence of high temperatures on structural materials properties.</p> <p>Determination of time and space development of temperature in a structure. Specifics of different materials and types of structure. Calculation of fire resistance of structures in accordance to Eurocode standards.</p> |

**Temeljna literatura in viri/Readings:**

Buchanan, A. H. 2005. Structural Design for Fire Safety, John Wiley & Sons Ltd.

Wald, F. et al. 2004. Vypočet požarni odolnosti stavebnih konstrukci. Tehniška univerza v Pragi.

Eurokod EN 1991-1-2 in požarni deli Eurokodov za lesene, armiranobetonske in jeklene konstrukcije.

**Cilji in kompetence:**

- Spoznati in razumeti obnašanje materialov, elementov in konstrukcij pri visokih temperaturah.
- Spoznati in razumeti osnovne inženirske modele požarne obtežbe. Privzgojiti občutek za pomen aktivnih in pasivnih ukrepov požarne zaščite v luči socioloških, naselitvenih, ekonomskih in drugih faktorjev.
- Vpeljati osnovna načela požarno varnega projektiranja lesenih, armiranobetonskih in jeklenih konstrukcij v skladu z ustreznimi deli gradbenih standardov (EVROKOD).
- Navajati študente na določitev in predstavitev požarnih problemov, izbiro metode reševanja ter predstavitev in kritično oceno rezultatov.
- Poznavanje terminologije, pomena in enot pomembnejših količin v požarnem inženirstvu.
- Sposobnost ocene požarne ogroženosti objekta ter načrtovanja ukrepov požarne zaščite s poudarkom na pasivni požarni zaščiti konstrukcij (zasnova konstrukcij, zaščitne obloge).
- Sposobnost izbire primernega modela požarne obtežbe.
- Sposobnost uporabe poenostavljenih računskih metod za oceno požarne odpornosti enostavnih nosilnih konstrukcij.

**Objectives and competences:**

- To learn and understand the behavior of materials, elements and structures at high temperatures.
- To learn and understand the basic engineering models of design fire load. To obtain the sense of importance of active and passive actions of fire protection in the light of social, urban, economic and other factors.
- To introduce basic principles of fire safe design of timber, reinforced concrete and steel structures in accordance with appropriate parts of Eurocode standards.
- To accustom students to the determination and presentation of issues pertaining to fire, selection of method of solution as well as presentation and critical assessment of results.
- Knowledge of terminology, meaning and units of significant quantities in fire engineering.
- Capability of assessment of fire risk of an object and planning the fire protection actions with the emphasis on passive fire protection of structures (design of structures, protection coating).
- Capability to choose the appropriate model of fire loading.
- Capability to use simplified calculation methods for the assessment of fire resistance of simple structures.

**Predvideni študijski rezultati:**

- Študent
- bo sposoben oceniti s pomočjo osnovnih metod požarno odpornost lesenih, armiranobetonskih in jeklenih konstrukcij,
  - bo sposoben opredeliti ukrepe aktivne in pasivne požarne zaščite,

**Intended learning outcomes:**

- Student
- will be able to assess, using basic methods, fire resistance of timber, reinforced concrete and steel structures,
  - will be able to define basic actions of active and passive fire protection,

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| <ul style="list-style-type: none"> <li>- bo sposoben kritično ovrednotiti računske modele in poenostavitve v okviru standardov in predpisov,</li> <li>- bo sposoben uporabiti domačo in tujo literaturo ter evropske standarde in predpise s področja požarnega inženirstva,</li> <li>- bo sposoben pridobiti podatke s svetovnega spleta, uporabiti domače in tuje baze podatkov,</li> <li>- bo sposoben uporabiti razpoložljivo programsko opremo.</li> </ul> | <ul style="list-style-type: none"> <li>- will be able to critically evaluate computing models and simplification in the framework of standards and regulations,</li> <li>- will be able to use national and international literature as well as European standards and regulations from the field of fire engineering,</li> <li>- will be able to obtain data from internet, to use of national and international databases,</li> <li>- will be able to use available computer software.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                              |                              |
|------------------------------|------------------------------|
| Predavanja, seminarske vaje. | Lectures, seminar tutorials. |
|------------------------------|------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                               |          |                              |
|-------------------------------|----------|------------------------------|
| Dva kolokvija ali pisni izpit | 100,00 % | Two midterms or written exam |
|-------------------------------|----------|------------------------------|

**Reference nosilca/Lecturer's references:**

HOZJAN, Tomaž, SAJE, Miran, SRPČIČ, Stane, PLANINC, Igor. Fire analysis of steel-concrete composite beam with interlayer slip. Comput. struct., 2011, letn. 89, št. 1-2, str. 189-200.

SVENSSON, Staffan, TURK, Goran, HOZJAN, Tomaž. Predicting moisture state of timber members in a continuously varying climate. Eng. struct., 2011, letn. 33, št. 11, str. 3064-3070.

HOZJAN, Tomaž, PLANINC, Igor, SAJE, Miran, SRPČIČ, Stane. Buckling of an axially restrained steel column under fire loading. International journal of structural stability and dynamics, 2011, letn. 11, št. 3, str. 451-472.



## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                            |
|----------------------|----------------------------|
| <b>Predmet:</b>      |                            |
|                      | <b>OSKRBA S PITNO VODO</b> |
| <b>Course title:</b> |                            |
|                      | <b>WATER SUPPLY</b>        |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik | Semestri |
|---------------------------------------------------------------|---------------------------------|--------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) |        | Zimski   |

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| <b>Univerzitetna koda predmeta/University course code:</b> | 1880 |
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| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 20         | 10      | 15   | 15            | 0                    | 60              | 4    |

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| <b>Nosilec predmeta/Lecturer:</b> | Nataša Atanasova, Primož Banovec |
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| <b>Vrsta predmeta/Course type:</b> | Izbirni strokovni/Elective professional |
|------------------------------------|-----------------------------------------|

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|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

|                                                                              |                                                                                                                  |
|------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b>                                                                                            |
| Opravljen predmet: Hidromehanika in hidravlika (Operativno gradbeništvo 1).  | Passed exam in Hydromechanics and Hydraulics (Construction Management BA 1) or a course with comparable content. |

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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p>Predavanja:</p> <ul style="list-style-type: none"> <li>- Uvod, poslanstvo, zgodovinski razvoj. Analiza porabe vode, norma porabe. Vodni viri in zajetja. Kakovost vode – zahteve za pitno vodo in ključni viri onesnaženj, vrste vodnih virov. Osnovni koncepti priprave pitne vode.</li> <li>- Vrste in razdelitev vodovodnih sistemov. Objekti na vodovodnih sistemih. Karakteristike cevi in črpalk.</li> </ul> | <p>Lectures:</p> <ul style="list-style-type: none"> <li>- Introduction, mission, and historical development. Analysis of water consumption, the norm of consumption. Water resources and captures. Water quality - Drinking water requirements and key sources of pollution, types of water resources. Basic concepts of drinking water preparation</li> <li>- Types and distribution of water supply systems. Elements of water supply systems. Characteristics of</li> </ul> |

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| <p>Osnova hidravlike vodovodnih sistemov, hidravlika toka pod tlakom, tlačne izgube.</p> <ul style="list-style-type: none"> <li>- Zakonske osnove za izvajanje oskrbe s pitno vodo in ključne naloge izvajalcev oskrbe, standardi oskrbe, postopki zagotavljanja skladnosti z zakonskimi zahtevami (poročanje). Obvladovanje tveganj in obratovanje z vodovodnimi sistemi v izrednih razmerah in procesi prilagajanja podnebnim spremembam in spremembam v potrebi po vodi. Prehodna obdobja za prilagajanje.</li> <li>- Trajnostno upravljanje z vodovodnimi sistemi, določanje ciljev in ukrepov; vodne izgube, digitalizacija procesov pri oskrbi s pitno vodo, zajem podatkov, daljinsko upravljanje, SCADA sistemi (primeri in procesi obdelave podatkov). Alternativni viri vode, nadomeščanje in prehod, oskrba z vodo za gašenje požarov. Energetska optimizacija vodovodnih sistemov, preventivno vzdrževanje vodovodnih sistemov.</li> <li>- Stroški izvajanja storitve oskrbe s pitno vodo in viri financiranja storitve.</li> </ul> <p>Vaje: osnove preračunov vodovodnih sistemov (dimenzioniranje, bilanca, izgube, poraba, viri).</p> <p>Klinične vaje: delo z opremo (npr. meritve pretokov, iskanje vodnih izgub, SCADA sistemi, črpalke in njihove karakteristike, preventivno vzdrževanje).</p> <p>Samostojno delo: študentje dobijo individualno situacijo, za katero morajo določiti upravljske parametre vodovodnega sistema in opredeliti ključne upravljske prioritete. Poseben poudarek: analiza tveganj, zmanjševanje vodnih izgub, poraba energije v vodovodnem sistemu, nadomestni vodni viri, vzroki za neskladnost z zahtevami za kakovost pitne vode.</p> | <p>pipes and pumps. The basis of hydraulics of pipe systems, hydraulics, and hydraulic losses.</p> <ul style="list-style-type: none"> <li>- Legal bases for the implementation of the water supply service and the key tasks of water supply providers (utilities), water supply standards, and compliance with legal requirements (including reporting). Risk management and operation of water supply systems in emergencies. Climate change adaptation process and water demand. Adjustment transition process.</li> <li>- Sustainable management of water supply systems, determination of operational objective and catalogue of measures; Water losses, digitization of processes in drinking water supply, data acquisition, remote control, SCADA systems (examples and processing processes). Alternative water sources, replacement and adaptation process, water supply for firefighting. Energy optimization of water supply systems, preventive maintenance of water supply systems.</li> <li>- Cost of drinking water supply service provision and sources of financing of the service.</li> </ul> <p>Exercises: Basics design of water supply systems (dimensioning, water balance, water losses, consumption, water resources).</p> <p>Laboratory work: work with laboratory equipment (e.g. flow measurements, active leakage control, SCADA systems, pumps and their characteristics, preventive maintenance).</p> <p>Individual work: Students get a problem with a specific water supply system for which they have to determine the management parameters and define key management priorities. Particular emphasis: risk analysis, reduction of water losses, energy consumption in the water supply system, replacement water resources, and causes of non-compliance with drinking water quality requirements.</p> |
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#### Temeljna literatura in viri/Readings:

Kompare, B., 2013. Vodovod in priprava pitne vode, interna skripta, slikovno gradivo.

Kompare, B. Rismal M. 1996, 2013. Priprava pitne vode (skripta).

Viessman, W., Hammer, M.J., Chadik, P., Perez, E.M. 2008. Water Supply and Pollution Control: International Version. Pearson Education.

AWWA. 2010. Water Supply Operations: Water Treatment, 4th Ed. AWWA.

World resources institute. 2011. World Resources Report 2010-2011.

J. Mutschmann, F. Stimmelmayer (2002-2011) Taschenbuch der Wasserversorgung.

#### Cilji in kompetence:

##### Cilji

- Cilj predmeta je študentom dati znanja in spretnosti za analizo vodovodnih sistemov in problematike oskrbe s pitno vodo.

##### Kompetence

- Študent se nauči analizirati sistem oskrbe s pitno vodo, ki vključuje zajem vode, pripravo pitne vode in distribucijo vode.
- Poznavanje ukrepov s katerimi se dosega trajnostna oskrba s pitno vodo z razumevanjem izzivov oskrbe s pitno vodo v Sloveniji.
- Razume problematiko oskrbe z vodo iz alternativnih virov.
- Pozna sisteme monitoringa stanja.
- Pozna postopke iskanja vodnih izgub in orodja ki se pri tem uporabljajo.
- Razume glavne vzroke možnih odstopanj od standardov kvalitete pitne vode.
- Pozna načine upravljanja s tveganji v vodovodnih sistemih.
- Razumevanje ukrepov s katerimi se izvaja upravljanje sistemov oskrbe s pitno vodo
- Oskrba s pitno vodo v kontekstu podnebnih sprememb.
- Uporaba sodobnih orodij pri monitoringu in upravljanju vodovodnih sistemov in iskanju vodnih izgub.
- Poznavanje informatizacije/digitalizacije pri upravljanju z vodovodnimi sistemi.
- Razumevanje koncepta digitalnih dvojčkov pri upravljanju z vodovodnimi sistemi.

#### Objectives and competences:

##### Objectives

- The goal of the subject is to give students knowledge and skills to analyze water systems and the problems of drinking water supply.

##### Competences

- The student learns to analyze the drinking water supply system, which involves water capture, drinking water preparation, and water distribution.
- Student has knowledge of measures to achieve a sustainable supply of drinking water by understanding the challenges of drinking water supply in Slovenia.
- Understands the problem of water supply from alternative sources.
- Knows monitoring systems in the field of water supply.
- Understanding of processes of active leakage control and tools used in this process.
- Understanding of the main causes of possible deviations from the standards of drinking water quality.
- Understanding of risk management procedures in water supply systems.
- Understanding the measures which are implemented for the efficient and effective operation of water supply systems.
- Sustainable water supply in the context of climate change
- Use of state-of-the-art tools for the water supply system monitoring, management, and active leakage control.
- Understanding processes of ongoing digitalization/informatization in the management of water supply systems.

**Predvideni študijski rezultati:**

- Razumevanje vodooskrbe naselij in izzivov pri tem.
- Izvajanje projektov vodooskrbe (gradnja, upravljanje).

**Intended learning outcomes:**

- Knowledge about solving water supply for residential areas.
- Implementing water supply projects (construction, management).

**Metode poučevanja in učenja:**

Predavanja in laboratorijske vaje. Uporaba pridobljenih znanj pri izdelavi individualne seminarske naloge. Predvideni so ogledi objektov in naprav v okolici Ljubljane in ekskurzija po Sloveniji.

Uporaba laboratorijskih poligonov in terenske opreme za iskanje vodnih izgub.

**Learning and teaching methods:**

Lectures and laboratory tutorials. Use of the acquired knowledge for the elaboration of individual seminar work. Foreseen are visits to objects and devices near Ljubljana and field trips in Slovenia.

Use of laboratory polygons and field equipment for active leakage control.

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                          |         |                          |
|--------------------------|---------|--------------------------|
| Pisni in/ali ustni izpit | 50,00 % | Written and/or oral exam |
| Seminarska naloga        | 20,00 % | Seminar work             |
| Vaje                     | 30,00 % | Tutorials                |

**Reference nosilca/Lecturer's references:**

ATANASOVA, Nataša, DALMAU, Montserrat, COMAS, Joaquim, POCH ESPALLARGAS, Manel, RODRIGUEZ-RODA, Ignasi, BUTTIGLIERI, Gianluigi. Optimized MBR for greywater reuse systems in hotel facilities. Journal of environmental management, ISSN 0301-4797, 2017, letn. 193, št. maj, str. 503-511, ilustr., doi: 10.1016/j.jenvman.2017.02.041.

ŠIVIC, Ana, ATANASOVA, Nataša, PUIG, Sebastià, GRIESSLER BULC, Tjaša. Ammonium removal in landfill leachate using SBR technology - dispersed versus attached biomass. Water science and technology, ISSN 0273-1223, 2017, vol. 77, iss. 1, str. 27-38, ilustr., doi: 10.2166/wst.2017.519.

RADINJA, Matej, BANOVEC, Primož, COMAS, Joaquim, ATANASOVA, Nataša. Modeliranje in ocena vplivov razpršenih ukrepov zadrževanja in ponikanja padavinske vode na odtok iz urbanega povodja = Modelling and evaluating impacts of distributed retention and infiltration measures on urban runoff. Acta hydrotechnica, ISSN 1581-0267. [Spletna izd.], 2017, vol. 30, no. 52, str. 51-64, ilustr. ftp://ksh.fgg.uni-lj.si/acta/a30mr.pdf.

BANOVEC, Primož, KOZELJ, Daniel, ŠANTL, Sašo, STEINMAN, Franci. Izbira merilnih mest v vodovodnih sistemih z genetskimi algoritmi. Strojniški vestnik, ISSN 0039-2480, 2006, letn. 52, št. 12, str. 817-834, graf. prikazi.

STEINMAN, Franci, BANOVEC, Primož, ŠANTL, Sašo. Načrtovanje razvoja vodovodnih sistemov z uporabo genetskih algoritmov = Genetic-algorithms-supported planning of water-supply systems. Strojniški vestnik, ISSN 0039-2480, 2001, letn. 47, št. 6, str. 263-279.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                |
|----------------------|--------------------------------|
| <b>Predmet:</b>      |                                |
|                      | <b>TRAJNOSTNO INŽENIRSTVO</b>  |
| <b>Course title:</b> |                                |
|                      | <b>SUSTAINABLE ENGINEERING</b> |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik | Semestri      |
|---------------------------------------------------------------|---------------------------------|--------|---------------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) |        | Letni, Zimski |

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|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1879 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 15      | 15   | 0             | 0                    | 60              | 4    |

|                                   |              |
|-----------------------------------|--------------|
| <b>Nosilec predmeta/Lecturer:</b> | Matjaž Mikoš |
|-----------------------------------|--------------|

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| <b>Vrsta predmeta/Course type:</b> | Izbirni splošni/Elective general |
|------------------------------------|----------------------------------|

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|--------------------------|----------------------|----------------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina, English |
|                          | Vaje/Tutorial:       | Slovenščina, English |

|                                                                              |                                                      |
|------------------------------------------------------------------------------|------------------------------------------------------|
| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b>                                |
| Vpis na Univerzo v Ljubljani, v 2. ali 3. letnik.                            | University of Ljubljana, 2nd or 3rd Year enrollment. |

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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <ul style="list-style-type: none"> <li>- Podnebne spremembe, podnebna kriza in vzdržni razvoj znotraj planetarnih mej. Prilagajanje na podnebne spremembe, družbeno-ekološki sistemi, odpornost in točke preloma, okoljske krize.</li> <li>- Trajnostni razvoj v svetu in v Sloveniji – kazalniki, stanje in trendi. Vloga trajnostnega inženirstva.</li> <li>- Analiza trajnostnega razvoja Slovenije: gospodarstvo, družba, okolje.</li> <li>- Vloga raziskav in inovacij v družbenem razvoju. Tehnološki razvoj – prebojne (inovativne) tehnologije. Prenos znanja in tehnologij z univerz v</li> </ul> | <ul style="list-style-type: none"> <li>- Climate change, climate crisis, and sustainable development within planetary boundaries. Adaptation to climate change, social-ecological systems, resilience and tipping points, ecological crises.</li> <li>- Sustainable development in the world and in Slovenia - indicators, status, and trends. The role of sustainable engineering.</li> <li>- Sustainable development analysis of Slovenia: economy, society, environment.</li> </ul> |

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| <p>gospodarstvo. Inovativni sistem – elementi, izzivi in vpliv na razvoj. Pravice in zaščita intelektualne lastnine.</p> <p>- Okoljska, družbena in upravljavaska odgovornost na različnih ravneh. Vloga univerz in terciarnega (univerzitetnega) izobraževanja v vzdržnem razvoju. Mednarodne smernice in primeri dobre prakse.</p> <p>- Trajnostno grajeno okolje, ocene življenjskega cikla, okoljski ogljični odtis, vodni odtis, zelena in modra gradnja ter zelene stavbe. Pametne stavbe in pametna mesta. Krožno gospodarstvo. Družba 5.0. Industrija 4.0. Četrta industrijska revolucija. Primeri trajnostnih rešitev (tehnologij) v inženirstvu.</p> <p>- Strategija trajnostnega razvoja Univerze v Ljubljani kot študija primera.</p> | <p>- The role of research and innovation in societal development. Technological development – disruptive technologies. Knowledge and technology transfer from universities to industry. The innovation system - elements, challenges, and impact on development. Intellectual property rights and protection.</p> <p>- Environmental, social, and governance responsibility at different levels. The role of universities and tertiary (university) education in sustainable development. International guidelines and examples of good practice.</p> <p>- Sustainable built environment, life cycle assessment, environmental carbon footprint, water footprint, green and blue infrastructure, and green buildings. Smart buildings and smart cities. Circular economy. Society 5.0. Industry 4.0. Fourth industrial revolution. Cases of sustainable solutions (technologies) in engineering.</p> <p>- The strategy of sustainable development of the University of Ljubljana as a case study.</p> |
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#### Temeljna literatura in viri/Readings:

##### Literatura / Literature:

Doorsamy, W., Paul, B.S., Marwala, T. (2020). The Disruptive Fourth Industrial Revolution. Springer, 2856 str. <https://link.springer.com/book/10.1007/978-3-030-48230-5>

Mulder, K. (2006). Sustainable Development for Engineers – A Handbook and Resource Guide. Routledge, 288 str.

Pretnar, B. (2020). Intelektualna lastnina in tržno uspešne inovacije: priročnik za managerje, raziskovalce in izumitelje. Ljubljana: Lexpera, GV založba, 167 str., ISBN 978-961-247-429-4

Sachs, J.D., Lafortune, G., Kroll, C., Fuller, G., Woelm, F. (2022). Sustainable Development Report 2022. Cambridge University Press, 493 str., doi.org/10.1017/9781009210058

Mikoš, M. (2023). Uvod v trajnostno inženirstvo – učbenik in priročnik. Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo (v pripravi).

##### Viri / Resources:

Učno gradivo v spletni učilnici UL FGG in na spletnih straneh UNESCO Katedre za zmanjševanje tveganj ob vodnih ujmah / Study material in web classroom at UL FGG and on the web pages of the UNESCO Chair on Water-related Disaster Risk Reduction.

Tiskane kopije relevantnih standardov s področja trajnostnega razvoja v čitalnici Knjižnice UL FGG / Printed copies of the relevant standards in the field of sustainable development, available in the reading room of the UL FGG Library.

#### Cilji in kompetence:

#### Objectives and competences:

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| <p><b>Cilji:</b></p> <ul style="list-style-type: none"> <li>- Spoznati in razumeti izzive razvoja zaradi podnebnih sprememb in podnebne krize.</li> <li>- Razumeti smeri in možnosti trajnostnega (vzdržnega) razvoja znotraj planetarnih mej.</li> <li>- Razumeti pomen moderne infrastrukture za razvoj družbe.</li> <li>- Privzgojiti družbeno odgovorno ravnanje pri delu.</li> <li>- Razumeti pomen in vlogo standardov na področju družbene odgovornosti podjetij.</li> <li>- Razumeti vlogo znanosti in raziskovanja, še posebej družbeno odgovornega raziskovanja v vzdržnem razvoju.</li> </ul> <p><b>Kompetence:</b></p> <ul style="list-style-type: none"> <li>- Kritično razmišljanje, okrepljena samoiniciativnost in inovativnost.</li> <li>- Sobivanje z naravo, razumevanje trajnosti kot vrednote.</li> <li>- Razumevanje vplivov (učinkov) ravnanja posameznika na okolje in podnebje.</li> </ul> | <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>- Know and understand the development challenges posed by climate change and crisis.</li> <li>- Understand the directions and options for sustainable development within planetary boundaries.</li> <li>- Understand the importance of modern infrastructure for the development of society.</li> <li>- To develop socially responsible behaviour at work.</li> <li>- Understand the importance and role of standards in the field of corporate social responsibility.</li> <li>- Understand the role of science and research, in particular socially responsible research, in sustainable development.</li> </ul> <p><b>Competences:</b></p> <p>Critical thinking, enhanced self-initiative, and innovation.</p> <p>Co-existence with nature, understanding sustainability as a value.</p> <p>Understanding the impact (effects) of individual behaviour on the environment and climate.</p> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| <p>Študent bo sposoben:</p> <ul style="list-style-type: none"> <li>- razumeti vlogo (prebojnih) tehnologij in inženirstva v vzdržnem razvoju družbe,</li> <li>- slediti izpolnjevanju ciljev trajnostnega razvoja Agende 2030 Združenih narodov,</li> <li>- uporabiti domačo in tujo strokovno literaturo ter standarde s področja vzdržnega (trajnostnega) razvoja družbe in podjetij,</li> <li>- samostojno poiskati relevantne podatke na svetovnem spletu o vzdržnem razvoju.</li> </ul> | <p>Student will be able to:</p> <ul style="list-style-type: none"> <li>- understand the role of (breakthrough) technologies and engineering in sustainable development,</li> <li>- follow the implementation of the United Nations Agenda 2030 Sustainable Development Goals,</li> <li>- apply national and international literature and standards in the field of sustainable development of society and enterprises,</li> <li>- independently search the internet for relevant information on sustainable development.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                                                                                                                  |                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Predavanja, vaje, domače naloge, krajši kvizi in krajše seminarske naloge, končna seminarska naloga na izbrano temo trajnostnega razvoja.</p> | <p>Lectures, tutorials, home works, quizzes and short seminar papers, final seminar paper on a sustainability topic of one's choice.</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|

**Načini ocenjevanja:****Delež/Weight Assessment:**

|                                                |          |                                                     |
|------------------------------------------------|----------|-----------------------------------------------------|
| Ocena seminarske naloge in njene predstavitev. | 100,00 % | Assessment of the seminar paper & its presentation. |
|------------------------------------------------|----------|-----------------------------------------------------|

**Reference nosilca/Lecturer's references:**

GLAVIČ Peter, MIKOŠ Matjaž, ŽIBERNA Bojana (2021). Inovacijski sistem Slovenije; Analiza trajnostnega razvoja Slovenije; Analiza visokošolskega izobraževanja v Sloveniji; Analiza raziskovalno-razvojne dejavnosti, inovacij in podjetništva v Sloveniji. V: Letopis Inženirske akademije Slovenije 18, 73-238, ISSN 1581-9728.

MIKOŠ, Matjaž (2021). Kompetenčni profil gradbenega inženirja = Competence profile of a civil engineer. Gradbeni vestnik, 70, 102-109, ISSN 0017-2774.

ISTENIČ, Andreja, MIKOŠ, Matjaž (2019). Delovni mentorji študentom UL FGG - povezovalni člen med akademskim in delovnim okoljem = Working mentors for UL FGG students - a link between academic and work environment. Gradbeni vestnik, 68, 98-105, ISSN 0017-2774.

MIKOŠ, Matjaž (2018). Graditev v vlogi dvigovanja odpornosti družbe in konkurenčnosti gospodarstva. V: KRIŠTOF, Tomaž (ur.). Družba, prostor, graditev: nova zakonodaja in stanovanjska gradnja: simpozij, 4. 4. 2018, Brdo pri Kranju. Ljubljana: Zbornica za arhitekturo in prostor Slovenije, 12-16, ISBN 978-961-92885-8-0. <https://www.youtube.com/watch?v=HwFoYvmYuCO>.

CEROVŠEK, Tomo, MIKOŠ, Matjaž (2014). A comparative study of cross-domain research output and citations: research impact cubes and binary citation frequencies. Journal of informetrics: an international journal. 8(1), 147-161, ISSN 1751-1577. DOI: 10.1016/j.joi.2013.11.004.



## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                                                                           |
|----------------------|-------------------------------------------------------------------------------------------|
| <b>Predmet:</b>      |                                                                                           |
|                      | <b>UNIVERZALNO NAČRTOVANA TRAJNOSTNA IN ZELENA STAVBA<br/>ZA ZDRAVJE IN DOBRO POČUTJE</b> |
| <b>Course title:</b> |                                                                                           |
|                      | <b>UNIVERSALLY DESIGNED SUSTAINABLE AND GREEN BUILDING<br/>FOR HEALTH AND WELLBEING</b>   |

| Študijski programi in stopnja                                 | Študijska smer                  | Letnik | Semestri |
|---------------------------------------------------------------|---------------------------------|--------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Ni členitve (študijski program) |        | Letni    |

|                                                     |      |
|-----------------------------------------------------|------|
| Univerzitetna koda predmeta/University course code: | 1883 |
|-----------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 35         | 30      | 0    | 25            | 0                    | 90              | 6    |

|                                   |                                       |
|-----------------------------------|---------------------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Alenka Plemelj Mohorič, Mateja Dovjak |
|-----------------------------------|---------------------------------------|

|                                    |                                  |
|------------------------------------|----------------------------------|
| <b>Vrsta predmeta/Course type:</b> | Izbirni splošni/Elective general |
|------------------------------------|----------------------------------|

|                          |                      |             |
|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

|                                                                              |                                   |
|------------------------------------------------------------------------------|-----------------------------------|
| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b>             |
| Vpis v 3. letnik (ZF UL)                                                     | Enrolment in the 3rd year (ZF UL) |

|                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                          |
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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                    | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                       |
| <ul style="list-style-type: none"> <li>- Pregled mednarodnih in nacionalnih pravnih aktov na področju trajnostne in zelene graditve; Evropske strategije trajnostne in zelene graditve.</li> <li>- Pomen univerzalnega oblikovanja za izvajanje človekovih dejavnosti / okupacij.</li> <li>- Pomen ergonomije za ohranjanje zdravja in dobrega počutja.</li> </ul> | <ul style="list-style-type: none"> <li>- Overview of international and national legislation in the field of sustainable and green construction; European Strategies for Sustainable and Green Built Environment.</li> <li>- Importance of universal design for the implementation of human activities/occupations.</li> <li>- Importance of ergonomics for maintaining health and well-being.</li> </ul> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>- Morfologija procesa načrtovanja trajnostnega in zelenega grajenega okolja za potrebe vseh ciljnih skupin, v vseh življenjskih obdobjih, glede na namembnost stavbe.</li> <li>- Vpliv senzornih dejavnikov v življenjskem okolju na dobro počutje in zdravje posameznika.</li> <li>- Digitalizacija kot podpora za človekovo delovanje: konvencionalne in napredne rešitve.</li> </ul> | <ul style="list-style-type: none"> <li>-Morphology of the design process for a sustainable and green built environment to meet the needs of all target groups, at all life stages, according to the building's purpose.</li> <li>-Influence of sensory factors in the living environment on the well-being and health of the individual.</li> <li>- Digitalisation as a support for human activity: conventional and advanced solutions.</li> </ul> |
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**Temeljna literatura in viri/Readings:**

Dovjak, M. (2019). Izbor gradbenih proizvodov v konstrukcijskih sklopih stavb: zdravstveni in varnostni vidik : univerzitetni učbenik za študente sanitarnega inženirstva. Univerza v Ljubljani, Zdravstvena fakulteta. (pp. 1-28, 142-164).

Dovjak, M., & Kuček, A. (2019). Creating healthy and sustainable buildings: an assessment of health risk factors. Springer Open, cop. <https://doi.org/10.1007/978-3-030-19412-3>. (pp. 1-74).

Sanford, J. A. (2012). Universal Design as a Rehabilitation Strategy. Springer Publishing Company. [Dostopno v DiKUL]. (pp.3-110; 267-277).

Fitzgibbon C, O'Sullivan J. (2018). Sensory modulation. Sensory Modulation Brisbane. (pp. 50-94).

**Cilji in kompetence:**

- Poznati zakonske zahteve in priporočila trajnostne in zelene graditve.
- Poznati in razumeti pomen univerzalnega oblikovanja za izvajanje človekovih dejavnosti / okupacij; ter pomen ergonomije za ohranjanje zdravja in dobrega počutja.
- Poznati in razumeti senzorne dejavnike v življenjskem okolju, ki vplivajo na dobro počutje in zdravje uporabnika.
- Razumeti pomen digitalizacije kot podpore za človekovo delovanje.
- Sposobnost načrtovanja elementov življenjskega okolja in njihovo interaktivnost.
- Sposobnost timskega delovanja.

**Objectives and competences:**

- Know the legal requirements and recommendations for sustainable and green building.
- Know and understand the importance of universal design for the performance of human activities/occupations; and the importance of ergonomics for maintaining health and well-being.
- Know and understand the sensory factors in the living environment that affect the well-being and health of the occupant.
- Understand the importance of digitalisation as a support for human functioning.
- To be able to design elements of the living environment and their interactivity.
- Ability to work as part of a team.

**Predvideni študijski rezultati:**

- Študent:
- uporabi zakonske zahteve, priporočila trajnostne in zelene graditve ter načela univerzalnega oblikovanja v projektni nalogi,

**Intended learning outcomes:**

- Use legal requirements, sustainable and green building recommendations, and universal design principles in the design brief.

|                                                                      |                                                                                 |
|----------------------------------------------------------------------|---------------------------------------------------------------------------------|
| - zna umestiti digitalne rešitve za kakovost bivanja in delovanja,   | - Know how to position digital solutions for quality of living and functioning. |
| - utemelji interaktivnost posameznih elementov življenjskega okolja, | - Found the interactivity of the different elements of the living environment.  |
| - argumentira predlog rešitev v multidisciplinarnem timu.            | - Argument a solution proposal in a multidisciplinary team.                     |

**Metode poučevanja in učenja:****Learning and teaching methods:**

Predavanja, seminar, klinične vaje, projektno delo.

Lectures, seminars, tutorials, project work.

**Načini ocenjevanja:****Delež/Weight****Assessment:**

Projektna naloga

100,00 %

Project assignment

**Reference nosilca/Lecturer's references:**

Dovjak, M., Shukuya, M., & Krainer, A. (2018). User-centred healing-oriented conditions in the design of hospital environments: 2140. International journal of environmental research and public health, 15, 10, 1-28.

Dovjak, M., Virant, B., Krainer, A., Šijanec-Zavrl, M., & Vaupotič, J. (2021). Determination of optimal ventilation rates in educational environment in terms of radon dosimetry. International journal of hygiene and environmental health, 234, 113742, 1-11.

Potočnik, J., Košir, M., & Dovjak, M. (2022). Colour preference in relation to personal determinants and implications for indoor circadian luminous environment. Indoor and built environment, 31(1), 121-138.

Schweiker, M., Fuchs, X., Becker, S., Shukuya, M., Dovjak, M., & Kolarik, J. (2017). Challenging the assumptions for thermal sensation scales. Building research and information, 45, 5, 572-589.

Recek, P., Kump, T., & Dovjak, M. (2019). Indoor environmental quality in relation to socioeconomic indicators in Slovenian households. Journal of housing and the built environment, 34, 4, 1065-1085.

Plemelj Mohorič, A., & Dovjak, M. (2019). Delovna terapija v procesu univerzalnega oblikovanja okolja = Occupational therapy in the process of universal design. In A. Oven (Ed.), Pogled v prihodnost: 55 let izobraževanja delovnih terapevtov Slovenije: zbornik prispevkov z recenzijo pp. 124-133. Univerza v Ljubljani, Zdravstvena fakulteta. [http://www2.zf.uni-lj.si/images/stories/datoteke/Zalozba/PosvetDT\\_2019.pdf](http://www2.zf.uni-lj.si/images/stories/datoteke/Zalozba/PosvetDT_2019.pdf).

Plemelj Mohorič, A. & Kacjan Žgajnar, K.(2020). Sedenje (še) ni moj problem. Revija za zdravstvene vede.7(2), 39-54. [https://fzv.uni-nm.si/uploads/\\_custom/FZV\\_pripone/revija/revija\\_jhs\\_2020\\_v7n2\\_www.pdf](https://fzv.uni-nm.si/uploads/_custom/FZV_pripone/revija/revija_jhs_2020_v7n2_www.pdf).

Plemelj Mohorič, A., & Kacjan Žgajnar, K.(2021). Izbrana poglavja iz ergonomije: učbenik za študente zdravstvenih ved. Zdravstvena fakulteta.

Plemelj Mohorič, A., & Vesenjaj, L.(2022). Obolenja roke, vratu in/ali rame pri pisarniških delavcih = Complaints of the arm, neck and/or shoulder among office workers. Slovenska revija za delovno terapijo : strokovna revija Društva in Zbornice delovnih terapevtov Slovenije 11(1),. 57-68, <https://zdts.si/index.php/dokumenti/download/20-slovenska-revija-za-delovno-terapijo/227-slovenska-revija-za-delovno-terapijo>.



## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|               |                                               |
|---------------|-----------------------------------------------|
| Predmet:      |                                               |
|               | <b>OSNOVE POTRESNEGA INŽENIRSTVA</b>          |
| Course title: |                                               |
|               | <b>FUNDAMENTALS OF EARTHQUAKE ENGINEERING</b> |

| Študijski programi in stopnja                                 | Študijska smer       | Letnik    | Semestri |
|---------------------------------------------------------------|----------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Konstruktiva (modul) | 3. letnik | Zimski   |

|                                                     |      |
|-----------------------------------------------------|------|
| Univerzitetna koda predmeta/University course code: | 1147 |
|-----------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 0    | 30            | 0                    | 60              | 4    |

|                            |               |
|----------------------------|---------------|
| Nosilec predmeta/Lecturer: | Matjaž Dolšek |
|----------------------------|---------------|

|                             |                                         |
|-----------------------------|-----------------------------------------|
| Vrsta predmeta/Course type: | Izbirni strokovni/Elective professional |
|-----------------------------|-----------------------------------------|

|                   |                      |             |
|-------------------|----------------------|-------------|
| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|                   | Vaje/Tutorial:       | Slovenščina |

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

|                                                                                                                                                |                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| Predmet je del modula Konstruktiva.<br>Pogoj za pristop k predmetu so opravljeni izpiti iz predmetov Trdnost, Statika linijskih konstrukcij I. | The course is part of the module Structures.<br>Passed exams in Strength of materials and Structural analysis. |
|------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|

**Vsebina:****Content (Syllabus outline):**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Uvod v dinamiko gradbenih konstrukcij. Dinamični odziv sistemov z eno prostostno stopnjo pri potresni obtežbi (računski model in enačbe gibanja, lastno nihanje, vsiljeno nihanje, spektri odziva). Poenostavljen način računa sistemov z več prostostnimi stopnjami pri potresni obtežbi (metoda z ekvivalentno statično obtežbo). Osnovni pojmi o potresih in potresni obtežbi (uvod, splošno o potresih, jakost potresa, potresi v prostoru in času, | Introduction to dynamics of structures. The dynamic response of the single-degree-of-freedom system under seismic action (computational model, equation of motion, free vibration, response under dynamic loading, response spectra). Simplified seismic analysis for multi-degree-of-freedom systems (Lateral force method). Basic terminology associated with earthquakes and seismic action (introduction, causes for earthquakes, intensity |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>značilnosti gibanja tal na lokaciji, princip redukcije potresnih sil, projektni spektri). Osnovni pojmi in načela potresnoodpornega projektiranja (splošno, nosilnost in duktilnost, togost, dušenje, zasnova konstrukcij). Obnašanje gradbenih objektov med minulimi potresi (geotehnični objekti, hidrotehnični objekti, mostovi in viadukti, stavbe, industrijski objekti). Vaje iz osnov dinamike konstrukcij in potresnega inženirstva. Individualna seminarska naloga: Potresna analiza enostavnega potresnoodpornega objekta.</p> | <p>measures, earthquakes in space and time, characteristics of seismic ground motion, concept of reduction of seismic forces, the design spectrum). Basic concepts and principles of earthquake-resistant design (strength, ductility, stiffness, damping, basics for preliminary design). Behaviour of structures during past earthquakes (geotechnical and hydrotechnical structures, bridges and viaducts, buildings, precast structures. Individual seminar: Seismic analysis of a simple structure.</p> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Temeljna literatura in viri/Readings:

Fajfar, P. 1995. Fundamentals of earthquake engineering (in Slovene). FGG UL, 83 pp.

Fajfar, P. 1984. Dynamics of structures (in Slovene). FGG UL, str.1-20, 27-88, 109-119, 132-144, 325-338.

Dolšek, M. 2007. Seismic analysis of simple buildings using ETABS (in Slovene).

Fajfar, P., Fischinger, M., Beg, D., Dolšek, M., Isaković, T., Kreslin, M., Rozman, M., Vidrih, Z., Čermelj, B. 2009. Eurocode 8: Design of earthquake-resistant structures (in Slovene). In Manual for design of structures using Eurocode 8, Eds. D. Beg and A. Pogačnik (selected chapters).

### Cilji in kompetence:

Cilji:

- spoznati osnove dinamike gradbenih konstrukcij ter osnovne pojme o potresih, potresni obtežbi in potresnoodpornem projektiranju.

Predmetnospecifične kompetence:

- razumevanje posledic potresov in obvladovanje različnih načinov zaščite pred njimi,
- obvladovanje enostavnih metod analize dinamičnih problemov,
- razumevanje in obvladovanje najenostavnejših načinov računanja potresnoodpornih objektov.

### Objectives and competences:

Objectives

- to understand the basics of structural dynamics, basic terminology about earthquakes, basic concepts of seismic action and earthquake-resistant design.

Competences:

- understanding a sense of the consequences of earthquakes and manage different ways of protection against them,
- to be informed with the methods of earthquake mitigation,
- to be capable of applying simple procedures for the seismic analysis of simple buildings.

### Predvideni študijski rezultati:

Študent

- bo sposoben grobo oceniti potresno odpornost enostavnih objektov in identificirati potresno neoporne objekte,
- bo sposoben uporabljati enostavne postopke za račun najenostavnejših potresnoodpornih objektov,

### Intended learning outcomes:

Student

- will be able to approximately assess the seismic resistance of simple buildings and identify earthquake-resistant structures,
- will be able to use simple methods for seismic analysis of structures,

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>- bo sposoben prepoznati odnos med posledicami potresa (in drugih naravnih nesreč) in vloženimi sredstvi za zmanjševanje posledic malo verjetnih dogodkov, negotovost matematičnih modelov za dejanske objekte in vplive na njih, inovativne možnosti za zmanjševanje posledic potresov,</li> <li>- bo sposoben uporabljati literaturo in spletne vire,</li> <li>- bo sposoben sodelovati z različnimi strokovnjaki.</li> </ul> | <ul style="list-style-type: none"> <li>- will be able to identify the relationship between the effects of the earthquake (and other natural disasters) and the funds invested for mitigating the consequences of unlikely events, the uncertainty of mathematical models used for simulation of seismic response of structures and the opportunities for innovative reduction of seismic losses,</li> <li>- will be able to use literature and online resources,</li> <li>- will be able to cooperate with the various experts.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                              |                         |
|------------------------------|-------------------------|
| Predavanja in računske vaje. | Lectures and tutorials. |
|------------------------------|-------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                       |         |                              |
|-----------------------|---------|------------------------------|
| Računski del izpita   | 30,00 % | Written exam: practical part |
| Vaje                  | 30,00 % | Exercises during year        |
| Teoretičen del izpita | 40,00 % | Teoretičen del izpita        |

**Reference nosilca/Lecturer's references:**

CELAREC, Daniel, DOLŠEK, Matjaž. Practice-oriented probabilistic seismic performance assessment of infilled frames with consideration of shear failure of columns. Earthquake eng. Struct. Dyn.. [Print ed.], jul. 2013, letn. 42, št. 9, str. 1339-1360, ilustr., doi: 10.1002/eqe.2275.

BROZOVIČ, Marko, DOLŠEK, Matjaž. Envelope-based pushover analysis procedure for the approximate seismic response analysis of buildings. Earthquake eng. Struct. Dyn.. [Print ed.] [v tisku] 2013, letn. XX, št. X, str. 1-10, ilustr., doi: 10.1002/eqe.2333.

CELAREC, Daniel, DOLŠEK, Matjaž. The impact of modelling uncertainties on the seismic performance assessment of reinforced concrete frame buildings. Eng. Struct.. [Print ed.], jul. 2013, letn. 52, št. , str. 340-354, ilustr., doi:10.1016/j.engstruct.2013.02.036.

FAJFAR, Peter, DOLŠEK, Matjaž. A practice-oriented estimation of the failure probability of building structures. Earthquake eng. Struct. Dyn.. [Print ed.], 2012, letn. 41, št. , str. 531-547, ilustr., doi: 10.1002/eqe.1143.

DOLŠEK, Matjaž, FAJFAR, Peter. The effects of masonry infills on the seismic response of a four-storey reinforced concrete frame -a deterministic assessment. Eng. Struct.. [Print ed.], julij 2008, letn. 30, št. 7, str. 1991-2001, graf. Prikazi, doi: 10.1016/j.engstruct.2008.01.001.

DOLŠEK, Matjaž, FAJFAR, Peter. The effects of masonry infills on the seismic response of a four-storey reinforced concrete frame - a probabilistic assessment. Eng. Struct.. [Print ed.], November 2008, letn. 30, št. 11, str. 3186-3192, graf. Prikazi, doi: 10.1016/j.engstruct.2008.04.031.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                              |
|----------------------|------------------------------|
| <b>Predmet:</b>      |                              |
|                      | <b>BIOKLIMATSKE ZGRADBE</b>  |
| <b>Course title:</b> |                              |
|                      | <b>BIOCLIMATIC BUILDINGS</b> |

| Študijski programi in stopnja                                 | Študijska smer       | Letnik    | Semestri |
|---------------------------------------------------------------|----------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Konstruktiva (modul) | 3. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1148 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 0    | 30            | 0                    | 60              | 4    |

|                                   |             |
|-----------------------------------|-------------|
| <b>Nosilec predmeta/Lecturer:</b> | Mitja Košir |
|-----------------------------------|-------------|

|                                    |                                         |
|------------------------------------|-----------------------------------------|
| <b>Vrsta predmeta/Course type:</b> | izbirni strokovni/Elective professional |
|------------------------------------|-----------------------------------------|

|                          |                      |             |
|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>                                                                                        | <b>Prerequisites:</b>                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Predmet je del modula Konstruktiva.</p> <p>Pogoj za pristop k predmetu je opravljen izpit iz Stavbarstva in Fizike oz. osvojena ustrezna primerljiva znanja.</p> | <p>Course is part of the elective module Structures.</p> <p>The prerequisite requirement for the participation is passed exams from Buildings and Physics or similar comparable courses.</p> |

| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Pojem bioklimatske orientacije: upoštevanje fizioloških potreb človeka in geografskih in podnebnih razmer lokacije pri oblikovanju bivalnega in delovnega okolja in sonaravni razvoj. Povezava biologija stavbe - ekologija stavbe. Osnovni modeli pasivnih sistemov: direktni zajem, zbiralnošranjevalna stena, steklenjak in hibridi. Stacionarna toplotna analiza stavbe s povezanimi mikroklimatskimi vplivi: prezračevanje, vlaga. Analiza dnevne svetlobe v prostoru. Analiza osončenja. Zvok</p> | <p>Concept of bioclimatic orientation: consideration of physiological human needs, geography and climate conditions for the design of sustainable living and working environment. Connections: building biology-building ecology. Basic models of passive solar systems: direct solar gain, indirect solar gain, conservatory and hybrids. Steady-state thermal analyses in relation to microclimatic influences: ventilation, humidity. Daylight analyses of active spaces. Analyses of building insolation. Analyses of</p> |



|                                                                                                                                                    |                                                                                                                                                          |
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| v prostoru. Vloga in izhodiščne zasnove kontrolnih sistemov. Pregled avtohtonih bioklimastko zasnovanih stavb v Sloveniji po regionalni strukturi. | sound insulation and room acoustics. The role and basic design of building management systems. Overview of vernacular bioclimatic buildings in Slovenia. |
|----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|

**Temeljna literatura in viri/Readings:**

Krainer, A. 2002. Viri in pasivni sistemi. Modul 2, Stavba 1. Ljubljana, Fakulteta za gradbeništvo in geodezijo, Katedra za stavbe in konstrukcijske elemente : Visoka šola za zdravstvo.

Košir, M., 2019. Climate Adaptability of Buildings: Bioclimatic Design in the Light of Climate Change, ISBN 978-3-030-18455-1, Springer La Roche, P. 2017. Carbon-neutral architectural design, ISBN 978-1-4987-1429-7, Taylor & Francis Goulding, J. R., Lewis, J. O., Steemers, T. C. 1992. Energy Conscious Design: A primer for Architects. B.T. Batsford Ltd.

Krainer, A. 2002. Viri in pasivni sistemi. Modul 2, Stavba 1. Ljubljana, Fakulteta za gradbeništvo in geodezijo, Katedra za stavbe in konstrukcijske elemente : Visoka šola za zdravstvo.

Jones, David Lloyd. 1998. Architecture and the environment : bioclimatic building design. London, Laurence King.

Študijsko gradivo dostopno na: e-učilnici UL FGG.

**Cilji in kompetence:****Cilji:**

- seznanitev z osnovami človekovega odziva na okolje ter obvladanje prenos sistema zunanje okolje – ovoj – notranje okolje – človek v konceptualizacijo realne stavbe,
- izboljšati kakovost grajenega okolja, zmanjšati negativne vplive, ki jih ima na zunanje okolje, usmerjanje v oblikovanje takih zgradb, ki upoštevajo principe trajnostnega razvoja z ustvarjanjem in odgovornim ravnanjem z zdravim grajenim okoljem, ki temelji na učinkoviti izrabi virov in ekoloških načelih ter pridobivanje znanja, tehničnih spretnosti in oblikovanje inovacijske sposobnosti za dvig kakovosti projektov in izboljšanje kakovosti grajenega okolja.

**Predmetnospecifične kompetence:**

- študent pozna konstitutivne elemente in procese, ki definirajo položaj umetnega okolja v naravnem okolju z upoštevanjem principa kontinuuma prostora in časa,
- obvlada prenos sistema zunanje okolje-ovoj-notranje okolje-človek v konceptualizacijo realne stavbe,
- razume značilnosti in delovanja osnovnih modelov pasivnih sistemov in njihovih realizacij,

**Objectives and competences:****Objectives:**

- getting familiar with the principles of human physiology and its response in different environments, mastering the transfer between the analysed system "outdoor environment-indoor environment-human" and the building conceptualization,
- to improve the quality of the built environment, to minimize negative impacts on the environment, to consider the principles of sustainable design, responsible design and management of healthy indoor environments, to apply ecological principles for efficient use of natural resources, to acquire knowledge, technical and innovative skills for improving quality of building projects.

**Competences:**

- getting familiar with the constitutive elements and processes that define the status of built environment in relation to natural environment, considering continuum of space and time principles,
- mastering of the transfer between the analysed system "outdoor environment-indoor environment-human" and building conceptualization,

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>- pozna izhodišča kontrolnih sistemov in njihovo vlogo pri optimizaciji delovanja stavb,</li> <li>- pozna regionalno strukturo bioklimatskih zgradb v Sloveniji,</li> <li>- obvlada postopek ocene toplotnega odziva stavbe (stacionarno); osončenja: dnevne svetlobe, požara; zvoka v prostoru,</li> <li>- sposoben je kritično oceniti in interpretirati pridobljene podatke (rezultate),</li> <li>- sposoben je uporabljati računske metode in programsko opremo za področje gradbene fizike,</li> <li>- obvlada veljavno zakonodajo za področje gradbene fizike (evropske direktive npr.CPD, slovensko zakonodajo npr. ZGO in podzakonske akte).</li> </ul> | <ul style="list-style-type: none"> <li>- understanding the characteristics and functioning of basic models of passive systems and their realizations,</li> <li>- getting familiar with the principles of control systems and their role in the process of building performance optimization,</li> <li>- getting familiar with the regional structure of vernacular buildings in Slovenia,</li> <li>- mastering the process of evaluation of thermal response of building (steady-state); insolation; daylight, fire, noise issues in active spaces,</li> <li>- ability to critically evaluate and interpret results,</li> <li>- ability to use calculation methods and computer software in the field of building physics, mastering of national and international legislation in the field of building physics (European directives, e.g. CPD, national legislation, e.g. ZGO and other requirements).</li> </ul> |
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**Predvideni študijski rezultati:**

- Sposobnost identifikacije bioklimatskih faktorjev pri načrtovanju in izvedbi stavb,
- razumevanje delovanja značilnih pasivnih sistemov in analize vplivov direktnega zajema (stacionarno), sposobnost izdelave analize stacionarnega toplotnega odziva, osončenja in koeficienta dnevne svetlobe ter analize zvoka v prostoru,
- uporaba računskih metod in programske opreme za analizo obravnavanih elementov toplotnega, svetlobnega in zvočnega odziva stavbe oziroma prostora,
- sposobnost samostojne ocene položaja in vloge posameznih obravnavanih funkcionalnih področij: predvsem toplota in dnevna svetloba ter z njimi povezanimi vplivnimi faktorji in identifikacija povezav med njimi,
- spretnosti uporabe domače in tuje literature in drugih virov, zbiranja in interpretiranja podatkov, identifikacija in reševanje problemov, kritična analiza, sinteza, delo v skupini.

**Intended learning outcomes:**

- Ability to identify all bioclimatic factors for the design and construction of buildings,
- understanding the functioning of typical passive solar systems with the analysis of influences of direct solar gain (steady-state), steady state analysis of thermal response, building insolation, daylight coefficient, sound insulation and acoustics,
- application of calculation methods and computer software for the analyses of the evaluated elements of thermal response of building/active space, daylight and sound issues,
- ability to evaluate the status and role of individual functional areas, e.g. thermal fluxes, daylight in relation with influential factors, identification of their connections,
- skills for review of relevant literature sources and other references (national, international), identification and problem solving, critical analyses, synthesis, team work.

**Metode poučevanja in učenja:**

Predavanja in uporaba računalniških programov za simulacijo in analizo gradbenofizikalnih vidikov

**Learning and teaching methods:**

Lectures and laboratory work. Laboratory work, performed in small groups: use of computer software for simulation and analysis of various

|                                                                                    |                                                                                |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| oblikovanja stavbe/prostora se izvaja na laboratorijskih vajah v manjših skupinah. | aspects of building physics, in the framework of building/active space design. |
|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                     |         |                 |
|---------------------|---------|-----------------|
| Laboratorijske vaje | 60,00 % | Laboratory work |
| Pisni izpit         | 40,00 % | Written exam    |

**Reference nosilca/Lecturer's references:**

KOŠIR, Mitja. Climate Adaptability of Buildings: Bioclimatic Design in the Light of Climate Change. Springer, cop. 2019. 243 str., ilustr. ISBN 978-3-030-18455-1. <https://www.springer.com/gp/book/9783030184551>, doi: 10.1007/978-3-030-18456-8.

PAJEK, Luka, KOŠIR, Mitja. Can building energy performance be predicted by a bioclimatic potential analysis? : case study of the Alpine-Adriatic region. Energy and buildings, ISSN 0378-7788. [Print ed.], mar. 2017, letn. 139, str. 160-173, ilustr., doi: 10.1016/j.enbuild.2017.01.035. [COBISS.SI-ID 7917153]

KOŠIR, Mitja, KRAINER, Aleš, ŠESTAN, Primož, KRISTL, Živa. Študija delovanja programske opreme za izračun porabe energije v stavbah = Study of computer software performance for calculation of energy use in buildings. Gradb. vestn., mar. 2013, letn. 62, str. 61-71.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                        |
|----------------------|------------------------|
| <b>Predmet:</b>      |                        |
|                      | <b>JEKLENE STAVBE</b>  |
| <b>Course title:</b> |                        |
|                      | <b>STEEL BUILDINGS</b> |

| Študijski programi in stopnja                                 | Študijska smer       | Letnik    | Semestri |
|---------------------------------------------------------------|----------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Konstruktiva (modul) | 3. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1149 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 0    | 30            | 0                    | 60              | 4    |

|                                   |              |
|-----------------------------------|--------------|
| <b>Nosilec predmeta/Lecturer:</b> | Leon Hladnik |
|-----------------------------------|--------------|

|                                    |                                         |
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| <b>Vrsta predmeta/Course type:</b> | Izbirni strokovni/Elective professional |
|------------------------------------|-----------------------------------------|

|                          |                      |             |
|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b>                          |
|------------------------------------------------------------------------------|------------------------------------------------|
| Predmet je del modula Konstruktiva.                                          | The course is a part of the module Structures. |
| Opravljen izpit iz predmeta Trdnost.                                         | Passed exam in Strength of materials.          |

| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Uvod: Kratek zgodovinski pregled izdelave jekla in razvoja jeklenih konstrukcij.</p> <p>Jeklo kot gradbeni material: postopki izdelave jekla, kemijska sestava, spreminjanje mehanskih lastnosti, mehanske lastnosti jekla, standardne kvalitete, označevanje in izbira kvalitete jekla. Tehnološki postopki izdelave jeklenih konstrukcij: vrste, načini izdelave in standardni asortiman polizdelkov, tehnološki postopki obdelave jekla, varjenje, zaostale napetosti. Varnost in zanesljivost jeklenih</p> | <p>Introduction: A brief historical overview of steelmaking and development of steel structures.</p> <p>Steel as a building material: steelmaking processes, chemical composition of steel and its effect on the mechanical properties, mechanical properties of steel, standard . Grades, labelling and choice of steel grade Technological processes of manufacture of steel elements/structures: types and methods of manufacture and the standard assortment of semi-finished steel elements, technological processing of steel elements, welding, residual stress. Safety and</p> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>konstrukcij: opredelitev mejnih stanj uporabnosti in mejnih stanj nosilnosti, delni varnostni faktorji.</p> <p>Vezna sredstva: zvari, vijaki, zakovice, čepi. Spoji osnovna načela projektiranja spojev, spoji v natezno in tlačno obremenjenih palicah, upogibno in torzijsko obremenjeni spoji, členkasti spoji.</p> <p>Uvod v stabilnost konstrukcij: osnovna načela stabilnosti, uklon tlačnih palic, bočna zvrnitev upogibnih nosilcev, lokalno izbočenje pločevin. Prečni prerezi jeklenih konstrukcij: razvrstitev prečnih prerezov po kompaktnosti, posebnosti vitkih prerezov, nosilnost prečnih prerezov. Nosilni elementi jeklenih konstrukcij: tlačne palice, natezne palice in vrvi, upogibni nosilci, tlačno in upogibno obremenjene palice.</p> <p>Uvod v sovprežne konstrukcije: osnovna načela, elastična analiza sovprežnih nosilcev, vpliv postopnosti gradnje, plastična analiza sovprežnih nosilcev. Jeklene stavbe: zasnova stavb, potresna, požarna in korozijska odpornost stavb, tehnološki postopki gradnje jeklenih stavb.</p> | <p>reliability of steel structures: the definition of ultimate limit states and serviceability limit states, partial safety factors. Fasteners: welds, screws, rivets, studs.</p> <p>Connections: design of joints – basic principles, joints in elements subjected to tension/compression, moment resistance joints, hinged joints.</p> <p>Introduction to structural stability: basic principles of stability, flexural buckling of columns, lateral – torsional buckling of beams. Local buckling of slender plates Cross-sections of steel elements: cross section classification as a function of plate slenderness, specifics of slender cross-sections, bearing capacity of cross-sections. Baring elements of steel structures: compression members, tension members, beams. Members in bending and axial compression.</p> <p>Introduction to composite structures: basic principles, plastic analysis of composite beams, the influence of construction phases. Plastic analysis of composite beams Steel buildings: conceptual design of steel buildings, seismic, fire and corrosion resistance of buildings, construction technologies.</p> |
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#### Temeljna literatura in viri/Readings:

Kržič, F. 1994. Jeklene konstrukcije I. Ljubljana, UL FGG, 208 str.

Nethercot. D. A. 1991. Limit States Design of Structural Steelwork, Chapman and Hall, London, 274 str.

Beg, D., Pogačnik, A , 2009. Priročnik za projektiranje gradbenih konstrukcij po evrokod standardih. Ljubljana, IZS.

Beg, D., Študijsko gradivo - izbrane teme. Dostopno na: [www.kmk.fgg.uni-lj.si/](http://www.kmk.fgg.uni-lj.si/).

#### Cilji in kompetence:

Cilji:

- pridobiti teoretična in praktična znanja, ki bodo omogočala študentu projektiranje jeklenih stavb.

Predmetnospecifične kompetence:

- razumevanje in obvladovanje določanja konstrukcijske zasnove, obtežbe, računskega modela, dimenzioniranja in poznavanja postopkov gradnje tipične enoetažne in večetažne jeklene stavbe,

- razumevanje vseh elementov pri izdelavi projektnega elaborata jeklene konstrukcije.

#### Objectives and competences:

Objectives:

- to gain the theoretical and practical knowledge that allows the design of steel buildings.

Competences:

- understanding and managing the structural concept, design loads, calculation model, design of elements and knowledge in construction of typical single and multi-storey building,

- understanding the elements of a design project of steel structures.

**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Študent</p> <ul style="list-style-type: none"> <li>- bo sposoben izdelati projekt jeklenih konstrukcij bo sposoben voditi in nadzorovati gradnjo jeklenih konstrukcij,</li> <li>- bo sposoben uporabljati obstoječo programsko opremo za analizo jeklenih konstrukcij,</li> <li>- bo sposoben sodelovati in odločati pri sprejemanju odločitev,</li> <li>- bo sposoben kritične presoje posameznega problema, izločitve neustreznih rešitev in utemeljene izbire ene od ustreznih rešitev.</li> </ul> | <p>Student</p> <ul style="list-style-type: none"> <li>- will be able to draw a project of steel structure and to manage and supervise the construction of steel structure,</li> <li>- will be able to use computer aided software for the analysis of steel structures,</li> <li>- will be able to cooperate with other experts and to decide in the decision-making process,</li> <li>- will be able to critically judge individual problem, to eliminate inappropriate solutions and to justify the choice of possible solution.</li> </ul> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                  |                                               |
|--------------------------------------------------|-----------------------------------------------|
| Predavanja in vaje z izdelavo samostojne naloge. | The course consists of lectures and seminars. |
|--------------------------------------------------|-----------------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                   |         |                                      |
|-------------------|---------|--------------------------------------|
| Samostojna naloga | 40,00 % | Approved project work                |
| Zagovor naloge    | 30,00 % | Defence of the approved project work |
| Ustni izpit       | 30,00 % | Oral exam                            |

**Reference nosilca/Lecturer's references:**

|                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BEG, Darko, HLADNIK, Leon. Zaostale napetosti pri mikrolegiranih jeklih visoke trdnosti. Gradbeni vestnik, ISSN 0017-2774, 1993, let. 42, št. 11/12, str.267-275.                                                    |
| BEG, Darko, HLADNIK, Leon. Eigenspannungen bei geschweissten I-Profilen aus hochfesten Stählen. Der Stahlbau, ISSN 0038-9145, 1994, jr. 63, h. 5, str. 134-139.                                                      |
| BEG, Darko, HLADNIK, Leon. Numerična analiza lokalne stabilnosti varjenih nosilcev, narejenih iz jekel visoke trdnosti. Gradbeni vestnik, ISSN 0017-2774, 1995, 44, št. 9/10, str. 217-223.                          |
| BEG, Darko, HLADNIK, Leon. Experimentalna analiza lokalne stabilnosti varjenih nosilcev, narejenih iz jekel visoke trdnosti. Gradbeni vestnik, ISSN 0017-2774, 1996, let. 45, št. 1/2, str. 27-34.                   |
| BEG, Darko, HLADNIK, Leon. Eksperimentalna analiza lokalne stabilnosti varjenih I nosilcev, narejenih iz jekel visoke trdnosti. Gradbeni vestnik, ISSN 0017-2774, januar-februar 1996, let. 45, št. 1/2, str. 27-34. |
| BEG, Darko, HLADNIK, Leon. Slenderness limit of class 3 I cross - sections made of high strength steel. Journal of Constructional Steel Research, ISSN 0143-974X. [Print ed.], 1996, vol. 38, no. 3, str. 201-217    |

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                               |
|----------------------|-----------------------------------------------|
| <b>Predmet:</b>      |                                               |
|                      | <b>RAČUNALNIŠKO PROJEKTIRANJE KONSTRUKCIJ</b> |
| <b>Course title:</b> |                                               |
|                      | <b>COMPUTER-AIDED DESIGN</b>                  |

| Študijski programi in stopnja                                 | Študijska smer       | Letnik    | Semestri |
|---------------------------------------------------------------|----------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Konstruktiva (modul) | 3. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1150 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 0    | 30            | 0                    | 60              | 4    |

|                                   |                               |
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| <b>Nosilec predmeta/Lecturer:</b> | Matija Gams, Tatjana Isaković |
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| <b>Vrsta predmeta/Course type:</b> | Izbirni strokovni/Elective professional |
|------------------------------------|-----------------------------------------|

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|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

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

Predmet je del modula Konstruktiva. Opravljeni izpiti pri predmetih: Računalništvo, Inženirska komunikacija, Fizika, Inženirska matematika I in II, Gradiva, Statika, Trdnost, Statika gradbenih konstrukcij, Osnove masivnih konstrukcij.

The course is included into the module Structural Engineering. The prerequisites are passed exams in Computer science, Engineering communication, Physics, Engineering mathematics I and II, Construction and building materials, Statics, Strength of materials, Structural analysis, Fundamentals of concrete and masonry structures.

**Vsebina:****Content (Syllabus outline):**

S pomočjo računalniških orodij študent analizira enostaven most. Pri tem na podlagi veljavne zakonodaje določi vplive, ki delujejo na konstrukcijo, vključno s prometno obtežbo in vplivi temperaturnih sprememb; zasnuje ustrezen numerični model konstrukcije, s pomočjo katerega bo analiziral vplive v konstrukciji; spozna osnove metode končnih

Each student has to complete individual project, where he/she should apply the knowledge obtained through lectures and tutorials. Each task should be completed using computer programmes. The content of the course is: engineering modelling of actions on bridges under standard and exceptional load including traffic load and temperature load;

|                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| <p>elementov in s "peš" računom določi učinke vplivov na konstrukcijo; z računalniškim programom analizira vplive v konstrukciji in kontrolira "peš" račun; z ustreznimi računalniškimi orodji dimenzionira tipični elemente konstrukcije. Z ustreznim računalniškim programom pripravi projektno dokumentacijo, ki med ostalim vključuje tehnično poročilo; naredi načrt objave in v primerni obliki objavi; izdelani projekt na Internetu.</p> | <p>engineering modelling of civil engineering structures; basics of finite element analysis of structures that can be modelled by beam-column elements; extended use of computer programme for the analysis of bridges, control of results by hand calculations; use of the computer programme for reinforcement design. Use of the computer programme for the preparation of complete project documentation (including formwork drawings, and reinforcement drawings of selected structural element, technical report, etc.) Publishing the basic data about a project on the Internet.</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Temeljna literatura in viri/Readings:

Izbrana poglavja iz:

Evrokod standardi: SIST EN 1990:2004, SIST EN 1991-1-1:2004, SIST EN 1991-1-3:2004, SIST EN 1991-1-4:2004, SIST EN 1991-2:2004, SIST EN 1992-1-1:2005, SIST EN 1998-1:2005.

SAP 2000, Linear and Nonlinear Static and Dynamic Analysis and Design of Three-Dimensional Structures, Basic Analysis Reference Manual, Computers and Structures, Berkeley, ZDA, 2012 (nameščemo na računalnikih v računalniških učilnicah na UL FGG).

Lutar, B., Duhovnik, J., 2004. Metoda končnih elementov za linijske konstrukcije, Univerza v Mariboru, Fakulteta za gradbeništvo.

Duhovnik, J., 2005. Statika linijskih konstrukcij I. Ljubljana, UL FGG.

Priročnik za projektiranje gradbenih konstrukcij po Evrokod standardih (urednika D. Beg, D. in Pogačnik, A.) 2009. Ljubljana, IZS.

### Cilji in kompetence:

Cilji:

- pridobiti praktično znanje o poteku in načinu projektiranja gradbenih konstrukcij s pomočjo sodobnih orodij informacijske tehnologije v različnih fazah projekta: v fazi konceptualne zasnove, v fazi modeliranja in analize, v fazi izdelave detajlov, pri pripravi različne dokumentacije (opažni načrti, armaturni načrti, itd.) in drugih delov projektne dokumentacije in predstavitev projekta,
- pridobiti znanje o projektiranju gradbenih konstrukcij in teoretičnih osnovah na katerih temelji analiza gradbenih konstrukcij s pomočjo tipičnih računalniških programov.

Predmetnospecifične kompetence:

- razumeti in obvladati praktično uporabo orodij informacijske tehnologije v fazah priprave projekta, modeliranja in analize, konstruiranja, priprave

### Objectives and competences:

Objectives:

- to obtain the theoretical knowledge and obtain and extend skills for the use of IT support in different phases of projects: conceptual design, modelling and analysis, detailing, preparation of different kinds of drawings (formwork drawings, reinforcement drawings, etc.), preparation of other parts of project documentation and presentation of the project,
- to gain knowledge about the analysis and design of civil engineering structures and theoretical bases of the analysis using computer programmes.

Competences:

- to understand and to use information technology tools at different phases of projects: conceptual design, modelling and analysis, detailing, preparation of different kinds of drawings



|                                                                                    |                                                                                      |
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| detajlov, priprave projektne dokumentacije in pri različnih predstavitev projekta. | preparation of other parts of project documentation and presentation of the project. |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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| <p>Študent</p> <ul style="list-style-type: none"> <li>- bo znal uporabljati različne računalniške programe za zasnovo, modeliranje in analizo konstrukcije, konstruiranje, pripravo projektne dokumentacije in predstavitev na različnih medijih,</li> <li>-bo spoznal , razumel in praktično uporabil teoretične osnove, na katerih temeljijo računalniški programi za analizo konstrukcij,</li> <li>- bo spoznal, razumel in praktično uporabil postopke analize konstrukcij pri pomični obtežbi,</li> <li>- bo spoznal, razumel in praktično uporabil postopke analize konstrukcij pri vplivu temperaturnih sprememb,</li> <li>- na konkretnem projektu enostavne gradbene konstrukcije bo sintetiziral in uporabil teoretična in praktična znanja, pridobljena v prvih petih semestrih študija,</li> <li>- bo sposoben samostojno uporabljati standarde in drugo strokovno literaturo.</li> </ul> | <p>Student</p> <ul style="list-style-type: none"> <li>- will be capable to use computer programmes to accomplish different project tasks: the conceptual design, modelling and analysis of structure, its design, the preparation of project documentation and project presentation using different media,</li> <li>- will learn, understand and use theoretical principles of the structural analysis performed by the computer programmes,</li> <li>- will learn, understand and use analysis procedures for structures subjected to moving loads,</li> <li>- will learn, understand and use analysis procedures for structures subjected to thermal actions,</li> <li>- will synthesise the knowledge obtained in the preceding courses related to the conceptual design, modelling, analysis and design of structures as well as information technology and use this knowledge within individual project task,</li> <li>- will be able to autonomously use relevant standards and other professional literature.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                            |                                                                                                 |
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| Predavanja, v okviru vaj študent izdela samostojno nalogo. | <p>Lectures, seminars and tutorials</p> <p>Each student has to complete individual project.</p> |
|------------------------------------------------------------|-------------------------------------------------------------------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                                       |         |                                                         |
|---------------------------------------|---------|---------------------------------------------------------|
| Zagovor naloge, ki se šteje kot izpit | 60,00 % | Defence of the project, which is considered as the exam |
| Samostojna projektna naloga           | 40,00 % | Individual project task                                 |

**Reference nosilca/Lecturer's references:**

VIDRIH, Zlatko, FISCHINGER, Matej, ISAKOVIĆ, Tatjana. Numerical investigation on smart magnetically controlled elastomeric bearings. J. vib. Control, nov. 2012, letn. 18, št. 13, str. 2073-2084, ilustr., doi: 10.1177/1077546311429060.

ISAKOVIĆ, Tatjana, FISCHINGER, Matej. Applicability of Pushover Methods to the Seismic Analyses of an RC Bridge, Experimentally Tested on Tree Shake Tables. Journal of earthquake engineering -JEE, 2011, št. 2, letn. 15, str. 303-320, ilustr., doi: 0.1080/13632461003802009.

ISAKOVIĆ, Tatjana, ZEVIK, Jaka, FISCHINGER, Matej. Floor response spectra in isolated structures subjected to earthquakes weaker than the design earthquake. Part 2, Isolation with magnetically controlled elastomeric bearings. Structural control & health monitoring. [Print ed.], 2011, letn. 18, št. 5, str.540-553, ilustr., doi: 10.1002/stc.391.

ISAKOVIĆ, Tatjana, ZEVIK, Jaka, FISCHINGER, Matej. Floor response spectra in isolated structures subjected to earthquakes weaker than the design earthquake. Part 1, Isolation with high-damping rubber bearings. Structural control & health monitoring. [Print ed.], 2011, letn. 18, št. 6, str. 635-659, ilustr., doi: 10.1002/stc.392.

ISAKOVIĆ, Tatjana, FISCHINGER, Matej. Pojednostavnjene nelinearne metode proračuna betonskih mostova = Simplified nonlinear method for the analysis of concrete bridges. Građevinar (Tisak), 2009, letn. 61, št. 7, str. 625-633, ilustr.

FISCHINGER, Matej, KRAMAR, Miha, ISAKOVIĆ, Tatjana. Cyclic response of slender RC columns typical of precast industrial buildings. Bulletin of earthquake engineering, avgust 2008, letn. 6, št. 3, str. 519-534, graf. Prikazi. Dostopno na: <http://www.springerlink.com/content/m282220243851270>, <http://www.springerlink.com/content/m282220243851270/fulltext.pdf>.

TRILLER, Petra, TOMAŽEVIČ, Miha, GAMS, Matija. Seismic behaviour of masonry buildings built of low compressive strength units. Bulletin of earthquake engineering, ISSN 1570-761X, Dec. 2018, vol. 16, iss. 12, str. 6191-6219, ilustr., doi: 10.1007/s10518-018-0418-5.

GAMS, Matija, TOMAŽEVIČ, Miha, BERSET, Thierry. Seismic strengthening of brick masonry by composite coatings : an experimental study. Bulletin of earthquake engineering, ISSN 1570-761X, Apr. 2017, str. 1-30, ilustr., doi: 10.1007/s10518-017-0136-4.

TOMAŽEVIČ, Miha, GAMS, Matija, BERSET, Thierry. Strengthening of stone masonry walls with composite reinforced coatings. Bulletin of earthquake engineering, ISSN 1570-761X, Jul. 2015, vol. 13, issue 7, str. 2003-2027, ilustr., doi: 10.1007/s10518-014-9697-7.

TOMAŽEVIČ, Miha, GAMS, Matija. Shaking table study and modelling of seismic behaviour of confined AAC masonry buildings. Bulletin of earthquake engineering, ISSN 1570-761X, jun. 2012, vol. 10, issue 3, str. 863-893, ilustr., doi: 10.1007/s10518-011-9331-x.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                         |
|----------------------|-------------------------|
| <b>Predmet:</b>      |                         |
|                      | <b>MASIVNI MOSTOVI</b>  |
| <b>Course title:</b> |                         |
|                      | <b>CONCRETE BRIDGES</b> |

| Študijski programi in stopnja                                 | Študijska smer       | Letnik    | Semestri |
|---------------------------------------------------------------|----------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Konstruktiva (modul) | 3. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1151 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 0    | 30            | 0                    | 60              | 4    |

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| <b>Nosilec predmeta/Lecturer:</b> | Jože Lopatič |
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| <b>Vrsta predmeta/Course type:</b> | Izbirni strokovni/Elective professional |
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| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b>                        | <b>Prerequisites:</b>                                                                                                         |
|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Predmet je del modula Konstruktiva.<br><br>Opravljen izpit iz predmeta Osnove masivnih konstrukcij. | The course is part of the module Structures.<br><br>Passed exams from course Introduction to concrete and masonry structures. |

| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| Pogoji in zahteve snovanja, projektiranja in izvedbe masivnih mostov. Računska obtežba mostov.<br>Prednosti in slabosti možnih konstrukcijskih sistemov mostnih konstrukcij. Tehnologije gradnje monolitnih in montažnih masivnih mostov.<br><br>Funkcije, dimenzioniranje in konstrukcijske posebnosti elementov betonskih mostov: odbojne in varovalne ograje, prekladna konstrukcija, oporniki, krila in prehodne plošče, ležišča in dilatacije, temelji. Odvodnjavanje mostov. Posebnosti modeliranja, | Conditions and demands for the design and execution of concrete bridges. Design load of bridges. Advantages and disadvantages of possible bridge structural systems. Construction technologies of monolithic and prefabricated concrete bridges.<br><br>Role, design and specifics of structural components of concrete bridges: bridge superstructures; piers, abutments, wing walls, approach slabs; structural bearings and expansion joints; foundations, footways, kerbs, traffic barriers and pedestrian |

|                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                               |
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| analize, dimenzioniranja in izvedbe montažnih betonskih mostov. Projektiranje enostavnih betonskih mostov. Ukrepi za zagotavljanje trajnosti betonskih mostov. Vzdrževanje in sanacije betonskih mostov. Izvedba konstrukcijskih detajlov in armature mostov. Izdelava opažnih in armaturnih načrtov mostov. | guardrails, bridge drainage systems. Specifics of modelling, analysis, design and construction of prefabricated concrete bridges. Design of simple concrete bridges. Measures to assure durability of concrete bridges. Maintenance and repair of concrete bridges. Execution of structural details and reinforcement detailing. Preparation of construction documentation (shop and reinforcement drawings). |
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**Temeljna literatura in viri/Readings:**

Leonhardt, F. 1994. Brücken/Bridges. Deutsche Verlags-Anstalt, 308 str.

Ryall, K.J., Parke, G.A.R., Harding, J.E. (uredniki). 2002. Manual of Bridge Engineering. Thomas Telford, 1012 str.

Radić, J. 2002. Mostovi. Sveučilište Zagreb, 550 strani.

Ustrezni deli standardov za gradbene konstrukcije Evrokod 0, Evrokod 1, Evrokod 2, Evrokod 6, Evrokod 7, Evrokod 8 (SIST EN 1990, SIST EN 1991-1, SIST EN 1991-2, SIST EN 1992-1-1, SIST EN 1992-2, SIST EN 1996-1-1, SIST EN 1997-1-1, SIST EN 1998-1).

Lopatič, J. 2014, Študijsko gradivo pri predmetu Masivni mostovi, UL FGG, 230 str.

**Cilji in kompetence:****Cilji:**

- spoznati temeljna načela snovanja in izvedbe gospodarnih mostnih konstrukcij.

**Predmetnospecifične kompetence:**

- razumevanje možnosti, prednosti in slabosti različnih konstrukcijskih sistemov betonskih mostov, ki so primerni v določenih krajevnih razmerah,
- obvladovanje osnovnih znanj s področja tehnologije gradnje masivnih mostov,
- obvladovanje zasnove in dimenzioniranja enostavnih mostnih konstrukcij.

**Objectives and competences:****Objectives:**

- to get familiar with basic principles of design and execution of economic bridge structures.

**Competences:**

- understanding of the possibilities, advantages and disadvantages of different structural systems of concrete bridges appropriate in specific local conditions,
- mastering the basic knowledge from the area of construction technology for concrete bridges,
- mastering the conception and design of simple bridge structures.

**Predvideni študijski rezultati:**

- Poznavanje različnih tehnologij gradnje masivnih mostov,
- uporaba temeljnih načel in pravil izvedbe detajlov in armiranja mostov,
- uporaba postopkov modeliranja, dimenzioniranja in konstruiranja na praktičnih primerih enostavnih betonskih mostov,

**Intended learning outcomes:**

- Knowledge of different construction technologies for concrete bridges,
- considering of the basic principles for the execution of details and bridge reinforcement,
- application of the procedures for modelling, design and detailing in practical cases of simple concrete bridges,

|                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| <ul style="list-style-type: none"> <li>- uporaba programske opreme za analizo in izdelavo izvedbenih načrtov masivnih mostov</li> <li>- sposobnost uporabe strokovne literature,</li> <li>- prepoznavanje stopnje zahtevnosti mostu v pogledu projektiranja in izvedbe,</li> <li>- sposobnost vključevanja v skupinsko delo,</li> <li>- sposobnost sinteze znanja pridobljenega pri predhodnih predmetih.</li> </ul> | <ul style="list-style-type: none"> <li>- application of software for the analysis and preparation of constructional drawings for concrete bridges,</li> <li>- ability to use professional literature,</li> <li>- recognising the level of complexity of a bridge in the sense of design and construction</li> <li>- ability of team work,</li> <li>- ability of making a synthesis of the knowledge acquired in previous courses.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

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|--------------------------------------------------------------|--------------------------------------------------------|
| Predavanja in vaje potekajo vzporedno preko celega semestra. | Lectures and tutorials run through the whole semester. |
|--------------------------------------------------------------|--------------------------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                       |         |                            |
|-----------------------|---------|----------------------------|
| Teoretični del izpita | 30,00 % | Theoretical part of exam   |
| Računski del izpita   | 30,00 % | Computational part of exam |
| Vaje                  | 40,00 % | Tutorials                  |

**Reference nosilca/Lecturer's references:**

SAJE, Drago, LOPATIČ, Jože. The effect of constituent materials on the time development of the compressive strength of high-strength concrete. Magazine of Concrete Research, ISSN 0024-9831, 2010, letn. 62, št. 4, str. 291-300.

LOPATIČ, Jože, SAJE, Franc. Non-linear analysis of time-dependent response of civil engineering structures. V: TOPPING, Barry H. V. (ur.), MONTERO, G. (ur.), MONTENEGRO, R. (ur.). Proceedings of the eighth International conference on computational structures technology, Las Palmas de Gran Canaria-Spain, 12-15 September 2006. Stirling: Civil-Comp, cop. 2006, str. 1-20.

SAJE, Drago, LOPATIČ, Jože, SAJE, Franc. Time dependent response of bridges to load and ambient conditions. V: DHIR, Ravindra K. (ur.). Role of concrete bridges in sustainable development : proceedings of the International Symposium dedicated to Professor Jirí Stráský, Technical University of Brno, Czech Republic held on 3-4 September 2003 at the University of Dundee, Scotland, UK. London: Thomas Telford, 2003, str. [205]-214.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                              |
|----------------------|----------------------------------------------|
| <b>Predmet:</b>      |                                              |
|                      | <b>ZAGOTAVLJANJE IN KONTROLA KAKOVOSTI</b>   |
| <b>Course title:</b> |                                              |
|                      | <b>QUALITY ASSURANCE AND QUALITY CONTROL</b> |

| Študijski programi in stopnja                                 | Študijska smer       | Letnik    | Semestri |
|---------------------------------------------------------------|----------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Organizacija (modul) | 3. letnik | Zimski   |

|                                                     |      |
|-----------------------------------------------------|------|
| Univerzitetna koda predmeta/University course code: | 1154 |
|-----------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 30   | 0             | 0                    | 60              | 4    |

|                            |           |
|----------------------------|-----------|
| Nosilec predmeta/Lecturer: | Žiga Turk |
|----------------------------|-----------|

|                             |                                         |
|-----------------------------|-----------------------------------------|
| Vrsta predmeta/Course type: | Izbirni strokovni/Elective professional |
|-----------------------------|-----------------------------------------|

|                   |                      |             |
|-------------------|----------------------|-------------|
| Jeziki/Languages: | Predavanja/Lectures: | Slovenščina |
|                   | Vaje/Tutorial:       | Slovenščina |

| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites:                                 |
|-----------------------------------------------------------------------|------------------------------------------------|
| Predmet je del modula Organizacija.                                   | The course is part of the module Organisation. |

| Vsebina:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Content (Syllabus outline):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Predavanja: definicije in pojem kakovosti, razvoj zagotavljanja; kakovosti skozi čas; eksterna in interna kontrola kakovosti; standardizacija; slovenski in evropski standardi; značilnosti sistemov vodenja kakovosti s poudarkom na njihovih značilnostih v gradbenih podjetjih; zagotavljanje kakovosti v vseh fazah procesa graditve (projektiranju, gradnji, vzdrževanju objektov); tehnike kontrole kakovosti vhodnih in izhodnih materialov v procesu proizvodnje; potrjevanje skladnosti gradbenih proizvodov; celovito zagotavljanje kakovosti. | Lectures: definition of quality, development of quality assurance concept; external and internal quality control; standardisation, Slovene and European standards; properties of quality management systems, with emphasis on their specified features in construction companies; quality assurance in all phases of construction process (design, construction, maintenance of structures); techniques of quality control of input and output material in the production process; conformity assessment of construction products; total quality management. |

**Temeljna literatura in viri/Readings:**

Šelih, J., 2015. Zagotavljanje in kontrola kakovosti, Učno gradivo, UL FGG.

Howarth, T., Greenwood, D., 2018. Construction quality management: principles and practice, Second edition. ed. Routledge Taylor & Francis Group, London New York.

Rumane, A.R., 2018. Quality Management in Construction Projects, Second Edition. Taylor & Francis Group, 6000 Broken Sound Parkway NW, Suite 300 Boca Raton, FL 33487-2742.

Marsden, P., 2019. Digital Quality Management in Construction, 1st ed. Routledge.  
<https://doi.org/10.1201/9780429423062>.

ASCE, 2012. Quality in the Constructed Project: A Guide for Owners, Designers, and Constructors, Third Edition. ed. American Society of Civil Engineers, Reston, VA. <https://doi.org/10.1061/9780784411896>.

**Cilji in kompetence:****Cilji:**

- pridobiti osnovna znanja s področja zagotavljanja in kontrole kakovosti,
- razumevanje pomena vodenja in zagotavljanja kakovosti v današnjem času, pri čemer je poudarek na posebnostih gradbene proizvodnje.

**Predmetnospecifične kompetence:**

- razume pomen kakovosti kot enega ključnih poslovnih ciljev gradbenega podjetja,
- pridobi znanja za celovito obvladovanje in kontrolo kakovosti proizvodnih in storitvenih postopkov v gradbeništvu,
- razume načine zagotavljanja kakovosti gradbenih proizvodov in gradbenih objektov,
- obvlada osnovne pojme s področja normizacije in standardizacije,
- je sposoben povezovati pridobljena znanja s predhodno pridobljenim znanji s področja organizacije,
- je sposoben reševati konkretne strokovne naloge s področja zagotavljanja kakovosti.

**Objectives and competences:****Objectives:**

- to obtain fundamental knowledge from the field of quality management,
- to understand the importance of quality assurance and management today; with emphasis on the specific features of construction production.

**Competences:**

- understands the meaning of quality as one of the key business goals of a company,
- acquires knowledge for comprehensive quality control used in production and service procedures in construction,
- understands the ways of construction product and construction service quality assurance,
- understands the fundamental concepts from the field of norms and standardization,
- is able to connect the acquired knowledge with previously gained knowledge from the management field,
- is able to solve concrete professional tasks from the quality management field.

**Predvideni študijski rezultati:****Študent**

- bo sposoben opredeliti praktične načine za zagotavljanje kakovosti v gradbenem podjetju in pri izvedbi gradbenega projekta,
- bo sposoben v gradbenem podjetju vzpostaviti sistem vodenja kakovosti,

**Intended learning outcomes:****Student**

- will be able to identify practical ways for ensuring quality in the organisation as well as in a construction project,
- will be able to establish a quality management system in the organisation,

|                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| - bo sposoben analizirati skladnost gradbenih proizvodov in zagotavljanje kakovosti med gradnjo,<br>- bo sposoben analizirati stanje zagotavljanja kakovosti in predlagati možne rešitve za izboljšanje,<br>- bo sposoben povezovati pridobljeno znanje z gradbeno prakso. | - will be able to analyze construction products conformity and quality assurance during construction,<br>- will be able to analyze the state concerning quality assurance and to propose possible solution to improve it,<br>- will be able to connect the acquired knowledge with construction practice. |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                                        |                                                                    |
|------------------------------------------------------------------------|--------------------------------------------------------------------|
| Predavanja in vaje na konkretnih primerih, izdelava seminarskih nalog. | Lectures and tutorial (case studies), preparation of seminar work. |
|------------------------------------------------------------------------|--------------------------------------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                     |         |                 |
|---------------------|---------|-----------------|
| Izpit               | 50,00 % | Exam            |
| 2 seminarski nalogi | 50,00 % | 2 seminar works |

**Reference nosilca/Lecturer's references:**

KOUTAMANIS, Alexander, DAINITY, Andrew, KVAN, Thomas, TURK, Žiga. The enigma of BIM. Architecture, Structures and Construction. 2021, letn. nov., [9] str., ilustr. ISSN 2730-9894.  
<https://link.springer.com/article/10.1007/s44150-021-00017-6>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=136007>, DOI: 10.1007/s44150-021-00017-6.

KLINC, Robert, TURK, Žiga. Construction 4.0 - digital transformation of one of the oldest industries. Economic and business review. 2019, vol. 21, no. 3, str. 393-410, ilustr. ISSN 1580-0466.  
[http://ojs.ebrjournal.net/ojs/index.php/ebr/article/view/786/pdf\\_163](http://ojs.ebrjournal.net/ojs/index.php/ebr/article/view/786/pdf_163), <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=114085&lang=slv>, DOI: 10.15458/ebr.92.

TURK, Žiga. Kakovost in odličnost metoda, ne cilj. V: ČUK, Jožko (ur.). Dvajset let kakovosti in odličnosti : [knjiga izdana ob dvajsetem jubileju Slovenskega združenja za kakovost in odličnost]. Ljubljana: Slovensko združenje za kakovost, 2011. Str. 80-85. ISBN 978-961-92534-5-8.

TURK, Žiga, FISCHINGER, Matej. Learning engineering from breakdown cases. V: IABSE symposium Rio de Janeiro 1999 : [Brazil, August 25-27] : structures for the future - the search for quality : report = rapport = Bericht. Rio de Janeiro: IABSE, 1999. IABSE reports, vol. 83. ISBN 3-85748-100-6.



## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                                       |
|----------------------|-------------------------------------------------------|
| <b>Predmet:</b>      |                                                       |
|                      | <b>OSNOVE GRADBENE EKONOMIKE</b>                      |
| <b>Course title:</b> |                                                       |
|                      | <b>FUNDAMENTALS OF ECONOMICS IN CIVIL ENGINEERING</b> |

| Študijski programi in stopnja                                 | Študijska smer       | Letnik    | Semestri |
|---------------------------------------------------------------|----------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Organizacija (modul) | 3. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1155 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 30   | 0             | 0                    | 60              | 4    |

|                                   |                              |
|-----------------------------------|------------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Robert Klinc, Primož Banovec |
|-----------------------------------|------------------------------|

|                                    |                                         |
|------------------------------------|-----------------------------------------|
| <b>Vrsta predmeta/Course type:</b> | Izbirni strokovni/Elective professional |
|------------------------------------|-----------------------------------------|

|                          |                      |             |
|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

|                                                                              |                                                |
|------------------------------------------------------------------------------|------------------------------------------------|
| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b>                          |
| Predmet je del modula Organizacija.                                          | The course is part of the module Organisation. |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| V okviru predmeta bodo slušatelji seznanjeni z ekonomskim okoljem, v okviru katerega se izvajajo gradbene storitve, proizvodnja gradbenih izdelkov in polizdelkov. Zato bodo v začetnem delu seznanjeni z osnovami delovanja trga, mikroekonomiko, osnovami teorije vrednosti in ponudbe/povpraševanja, v nadaljevanju pa z ožjim področjem trženja, priprave ponudb in obračuna gradbenih storitev in izdelkov.<br><br>Seznajeni bodo s specifičnostjo ekonomike in ekonomskih analitičnih postopkov v gradbeništvo, z | Within the scope of the topic, the audience will learn about the economic environment in which construction services, the production of construction products, and semi-finished products are provided. Therefore, in the first part, they will know the basics of the market, microeconomics the basics of value, and supply/demand theory, including the narrower marketing area, bidding, and costing of construction services and products.<br><br>Specificity of economics in construction, with the placement of construction in the cycle of the |

umestitvijo gradbeništva v krožni tok gospodarstva in proučevanjem krožnega toka gospodarstva. Razumevanje mikroekonomije in dejavnikov, ki vplivajo na trge, še posebej gradbene (agregatna ponudba in povpraševanje). Mikroekonomija gradbenega podjetja ter opredelitev trga gradbenih izdelkov in storitev; marketinške dejavnosti.

Razmerje ur med osnovami delovanja trga gradbenih izdelkov in storitev ter delom, ki obravnava trženje, pripravo ponudb ter obračun del je pol-pol. Specifičnost ekonomike v gradbeništvu, delno tudi mikroekonomika gradbenega podjetja ter opredelitev trga gradbenih izdelkov in storitev; marketinške dejavnosti, investicije v gradbene kapacitete; Finančna/ekonomska analiza stroškov in koristi, izdelava analize in njena umestitev v proces priprave investicijske dokumentacije, investicije v gradbene kapacitete; načrtovanje gradbene proizvodnje in razumevanje produkcijske funkcije, ekonomsko vrednotenje okolja in kriterijev trajnosti v gradbenem poslovanju in pri vrednotenju investicij; načrtovanje gradbene proizvodnje in razumevanje produkcijske funkcije kot inputa za doseganje outputa – gradbene storitve ali izdelka; oblikovanje cen za gradbeno proizvodnjo (lastna cena, prodajna cena); kalkulacijske metode za določanje lastnih stroškov za gradbene objekte in storitve; ocenjevanje ekonomičnosti gradbene proizvodnje in vpliv ekonomije obsega na stroške gradbene proizvodnje; specifičnost ocen in spremljanje stroškov gradbene proizvodnje v različnih fazah gradnje (načrtovanje, predpogodbni proces, spremljanje stroškov, zaključni obračuni) ter obvladovanje stroškov v času; empirične metode za vrednotenje in spremljanje stroškov, indeksi cen gradbenih izdelkov in storitev ter drugi viri podatkov za kalkulacije gradbenih del in obračun storitev; specifičnost stroškov vzdrževanja in obratovanja gradbenih objektov; metode delitve skupnih stroškov na posamezne procese gradnje; razumevanje različnih stroškov, ki nastajajo v procesu; gradnje in proces obvladovanja stroškov; osnove obvladovanja tveganj pri gradnji; vrednostna analiza.

Vloga računovodskih izkazov in sposobnost branja ter razumevanja računovodskih izkazov. Analiza računovodskih izkazov gradbenih podjetij in razlaga računovodskih izkazov ter ključnih indikatorjev, ki lahko opozarjajo na različna tveganja pri poslovanju gradbenega podjetja. Razumevanje makroekonomije in kako je gradbeništvo odvisno od

economy. Understanding of microeconomics and the factors that affect markets, especially construction (aggregate supply and demand). Microeconomics of a construction company and definition of construction products and services; marketing activities.

The ratio of hours devoted to construction product market operation and marketing part is 50:50. Specific features of economics in construction, microeconomics of a construction company, definition of construction product and services market; marketing activities, investments into construction assets; design of construction production, understanding of production function as input required to obtain the output construction service or product; determination of price of construction production (production price, offer price); calculation methods for the determination of production costs for structures and construction services; evaluation of construction production economics, influence of economy of scale on construction production costs; specific features of estimates and cost monitoring of construction production in various construction phases (design, pre-contract phase, cost monitoring, final invoicing) and cost control in time; empirical methods for evaluation and monitoring of costs, indices of construction product/service prices, other sources of data required for the calculation of construction work prices; specific features of prices of maintenance and operation of structures; methods of total cost division to individual construction processes; understanding of various costs appearing within a construction project, cost control process; fundamentals of construction risk management; value analysis.

Financial/economic analysis of costs and benefits, preparation of the analysis and its placement in the process of preparing investment documents, investment in construction capacity; economic evaluation of the environment in construction and in investment evaluation; Planning construction production and understanding the production function as an input to achieve the output - construction services or product; The evaluation of the economics of construction production and the influence of the economy extends to the cost of construction production. Role of accounting and the ability to read and understand financial statements resulting in the accounting process. Analyze construction company financial statements and

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>makroekonomskih procesov. Osnove trženja in kakšne so specifičnosti trženja v gradbeništvu. Osnove ravnanja z ljudmi pri delu, trg dela, procesi vodenja in vloge posameznikov v kompleksnih procesih.</p> <p>Digitalizacija/informatizacija poslovanja in vodenja gradbenih podjetij in posredno gradbenih procesov. Seznaitve s primeri informatizacije ključnih procesov v povezavi z meritvami učinkovitosti ključnih osnovnih dejavnosti podjetja.</p> <p>Oblikovanje vizije gradbenega podjetja v okviru dinamičnega poslovnega okolja, ki vključuje podnebne spremembe. Trajnostni kriteriji in proces certificiranja trajnostnega poslovanja podjetja s primeri.</p> <p>Izvajanje/demonstracija nekaterih simulacijskih iger za razumevanje ekonomskih procesov odločanje (npr. dilema zapornikov).</p> | <p>explain financial statements and key indicators that may indicate various risks in construction company operations. Understanding macroeconomics and how the construction industry depends on macroeconomic processes. The basics of marketing and the specifics of marketing in the construction industry. The basics of human resource management, labour market, management processes, and the role of individuals in complex processes, the basics of risk management.</p> <p>Digitalization/computerization of the operation and management of construction companies and indirect construction processes. Familiarity with examples of computerization of key processes related to measuring the efficiency of the main basic activities of the company.</p> <p>Design a vision for a construction company in a dynamic business environment that includes climate change. Sustainable criteria and procedures for certifying the company's sustainable operations with examples.</p> <p>Performance/demonstration of some simulation games to understand economic decision-making (eg prisoner's dilemma). Students will become familiar with the economic environment where construction services are being executed and construction products are being produced. In the introductory part, they will be acquainted with the fundamentals of market operation, microeconomics, fundamentals of value and supply/demand theory, and in continuation, with a specific field of marketing, preparation of offers, and billing of construction services and products.</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Temeljna literatura in viri/Readings:**

Samuelson, Paul Anthony ; Nordhaus, William D., (2002) Ekonomija, Ljubljana : GV založba ; - slovenski.

Jerina A. (2004), Priročnik za izdelavo analize stroškov in koristi investicijskih projektov, Služba Vlade RS za strukturno politiko in regionalni razvoj ISBN - 86-7061-296-8.

Pšunder, M. (1991). Ekonomika gradbene proizvodnje. Ljubljana, TZS, str. 1-121.

Pajk, M. 1987. Kalkulacije gradbenih del. str.1-98, 134-141.

Zakonodaja in standardi s področja investicijske dokumentacije, obračuna storitev gospodarskih javnih služb. Standardi s področja računovodstva (Slovenski računovodski standardi (SRS 2016)).

**Cilji in kompetence:****Objectives and competences:**

Cilji:

Objectives:

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>- pridobiti osnovna znanja ekonomike gradbene proizvodnje ter umeščanje gradbenega podjetja na trgu, tudi z razumevanjem računovodskih izkazov podjetij s poudarkom na gradbenih podjetjih,</li> <li>- analiza stroškov in koristi, njeni elementi in vpliv na proces odločanja (investicijska dokumentacija),</li> <li>- poslovanje gradbenega podjetja v okviru zahtev po kriteriji trajnosti poslovanja in drugih elementih poslovanja,</li> <li>- trženje, ravnanje z ljudmi pri delu,</li> <li>- pridobiti osnovna znanja ekonomike gradbene proizvodnje ter umeščanje gradbenega podjetja na trgu,</li> <li>- pridobiti sodobna znanja za celovito obvladovanje stroškov gradnje v vseh fazah ter osnovo za razumevanje odločitev in upravičenosti med večimi možnimi variantami (tehnološke, organizacijske, kadrovske, materialne narave).</li> </ul> <p>Predmetnospecifične kompetence:</p> <ul style="list-style-type: none"> <li>- razumevanje položaja ekonomske stroke v navezavi na gradbeno stroko,</li> <li>- detajlna seznanitev s ključnimi komponentami in procesi krožnega toka gospodarstva tudi vlogo države v krožnem toku gospodarstva in gradbeništvu,</li> <li>- proces odločanja, s poudarkom na uporabi analize stroškov in koristi, investicijska dokumentacija in proces odločanja o investiciji,</li> <li>- ekonomsko vrednotenje okolja - različni pristopi, tudi uporabnost in meje pristopa z ekosistemskimi storitvami,</li> <li>- mikroekonomija in delovanje mehanizmov povpraševanja in ponudbe, gibanje trgov v primerih sprememb, pogoji za delovanje trgov, trg gradbenih izdelkov in storitev,</li> <li>- trženje v gradbeništvu, specifični pristopi k trženju, trženjske raziskave,</li> <li>- razumevanje in zavedanje pomena zakonsko določenih okvirjev za trženje gradbenih izdelkov in storitev, urejanja pogodbenega odnosa in obračuna opravljenih storitev,</li> <li>- poznavanje in obvladovanje osnovnih orodij za podporo tem procesom,</li> </ul> | <ul style="list-style-type: none"> <li>- to acquire the fundamental knowledge of the economics of construction production, and placement of construction company on the market, including by understanding the financial statements of companies with an emphasis on construction companies,</li> <li>- costs and benefits analysis, its elements, and impact on the decision-making process (investment documentation – feasibility and pre-feasibility studies),</li> <li>- construction company operations in the framework of requirements for the criterion of business sustainability, and other elements of business: marketing, human resources management,</li> <li>- basic knowledge of the economics of construction production and the positioning of a construction company on the market,</li> <li>- to acquire modern knowledge for comprehensive control of construction costs in all phases and a basis for understanding decisions and justifications among several possible variants (technological, organizational, personnel, material nature),</li> <li>- to acquire contemporary knowledge for comprehensive cost control of construction in all phases, and a basis for understanding the decisions and justification in case of several possible alternatives (of technological, organisational, human resource, material nature).</li> </ul> <p>Competences:</p> <ul style="list-style-type: none"> <li>- understanding the situation of the economic profession in relation to the construction profession,</li> <li>- detailed knowledge of the main components and processes of the cycle of the economy and the role of government in the cycle of the economy and construction,</li> <li>- the decision-making process, with emphasis on the use of cost-benefits analysis, investment documentation, and the process of making investment decisions,</li> <li>- economic evaluation of the environment - various approaches, including the benefits and limitations of considering ecosystem services,</li> <li>- microeconomics and functioning of demand and supply mechanisms, market behaviour in changed</li> </ul> |
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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>- sposobnost pripraviti ponudbo, spremljati stroške ter realizacijo gradbenih del,</li> <li>- makroekonomska gibanja in njihov vpliv na gradbeništvo, razumevanje makroekonomskih indikatorjev,</li> <li>- ravnanje z ljudmi pri delu in njihov vpliv na uspešnost gradbenega podjetja,</li> <li>- digitalizacija in informatizacija poslovanja gradbenih podjetij,</li> <li>- trajnost poslovanja gradbenih podjetij, cilji, vrednotenje in proces certificiranja.</li> </ul> | <ul style="list-style-type: none"> <li>market conditions, specifics of some construction-related markets,</li> <li>- marketing in construction, specific approaches to marketing, and marketing research,</li> <li>- understanding and awareness of the importance of statutory frameworks for the marketing of construction products and services, the regulation of the contractual relationship, and the billing of services rendered,</li> <li>- knowledge and mastery of basic tools to support these processes,</li> <li>- the ability to prepare an offer, monitor costs, and the realization of construction works,</li> <li>- macroeconomics and its impact on construction, understanding macroeconomic indicators,</li> <li>- human resources management and their influence on the success of the construction company,</li> <li>- digitalization and computerization of construction companies,</li> <li>- sustainability of construction company operations, targets, evaluation, and certification process.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Študent:</p> <ul style="list-style-type: none"> <li>- bo sposoben na podlagi pridobljenih znanj razumeti umeščanje položaja gradbenega podjetja na trgu gradbenih izdelkov in storitev, sposoben ocenjevanja in vrednotenja investicij (CBA), razumevanja makroekonomskih trendov in umeščanja gradbenega podjetja v njem,</li> <li>- bo razumel procese informatizacije poslovanja gradbenih podjetij,</li> <li>- bo razumel osnove trženja in in ravnanja z ljudmi pri delu in njihovo vpliv na trajnostno poslovanje,</li> <li>- bo razumel poslovanje gradbenih podjetij z razumevnem vpliva podjetij na okolje in zahteve za trajnostno poslovanje podjetij,</li> <li>- bo sposoben uporabljati osnovno zakonodajo, ki obravnava to področje.</li> </ul> | <p>Based on the acquired knowledge, the student will be able:</p> <ul style="list-style-type: none"> <li>- to understand the position of a construction company in the construction products and services market, capable of evaluating and evaluating investments (CBA), understanding macroeconomic trends, and placing a construction company in it,</li> <li>- to understand the processes of computerization of construction companies,</li> <li>- to understand the basics of marketing and HRM and their impact on sustainable business operations,</li> <li>- to understand the business of construction companies with an understandable impact of companies on the environment and the requirements for sustainable business operations,</li> <li>- to apply the basic legislation that deals with this area.</li> </ul> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                                                   |                                                                                      |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Predavanja in vaje na konkretnih primerih, izdelava obsežnejše samostojne naloge. | Lectures, tutorial – practical examples, preparation of an independent seminar work. |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                   |         |                          |
|-------------------|---------|--------------------------|
| Samostojna naloga | 20,00 % | Individual seminar work  |
| Pisni izpit       | 80,00 % | Theoretical written exam |

**Reference nosilca/Lecturer's references:**

STEINMAN, Franci, KLASINC, Roman, BANOVEC, Primož. Ermittlung der erwarteten Schadengröße bei Überflutungen hochwassergefährdeter Gebiete unter Verwendung moderner Technologien = Determination of expected damage resulting from the inundation of areas exposed to flood risks, using up-to-date technologies. Österr. Wasser-Abfallwirtsch.. [Print ed.], 2001, jg. 53, h. 9/10, str. 242-247.

SRDIČ, Aleksander, BANOVEC, Primož, PONIKVAR, Janja, STEINMAN, Franci. Alokacija vode na podlagi ekonomskih kriterijev. V: 12. Mišičev vodarski dan, Maribor, 13. december 2001 : zbornik referatov. Maribor: Vodnogospodarski biro, 2001. Str. 1-6, ilustr. Mišičev vodarski dan, 12. ISSN 1318-2226.

BANOVEC, Primož, DOMADENIK MUREN, Polona. Pricing approaches in the case of cross border water supply. Procedia engineering. 2016, letn. 162, str. 601-610, ilustr. ISSN 1877-7058.  
<http://www.sciencedirect.com/science/article/pii/S1877705816334154>, DOI: 10.1016/j.proeng.2016.11.106.

BANOVEC, Primož, DOMADENIK MUREN, Polona. Paying too much or too little? : pricing approaches in the case of cross border water supply. Water science and technology: water supply. Apr. 2018, vol. 18, iss. 2, str. 577-585. ISSN 1606-9749. DOI: 10.2166/ws.2017.126.

TURK, Žiga, SONKOR, Muammer Semih, KLINC, Robert. Cybersecurity assessment of BIM/CDE design environment using cyber assessment framework. Journal of civil engineering and management. Tiskana izdaja. 2022, vol. 28, št. 5, str. 349–364, ilustr. ISSN 1392-3730.  
<https://journals.vilniustech.lt/index.php/JCEM/article/view/16682>, <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=137056>, DOI: 10.3846/jcem.2022.16682.

TURK, Žiga, KLINC, Robert. Potentials of blockchain technology for construction management. Procedia engineering. 2017, vol. 196, str. 638-645, ilustr. ISSN 1877-7058.  
<http://www.sciencedirect.com/science/article/pii/S187770581733179X>, DOI: 10.1016/j.proeng.2017.08.052.

KLINC, Robert, DOLENC, Matevž. Vpliv IT na produktivnost. Sistem : nove tehnologije za poslovni svet. [Tiskana izd.]. 2007, december, str. 12-14, barvne ilustr. ISSN 1318-9077. [COBISS.SI-ID 3786849]

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                        |
|----------------------|----------------------------------------|
| <b>Predmet:</b>      |                                        |
|                      | <b>PLANIRANJE IN VODENJE PROJEKTOV</b> |
| <b>Course title:</b> |                                        |
|                      | <b>PROJECT PLANNING AND MANAGEMENT</b> |

| Študijski programi in stopnja                                 | Študijska smer       | Letnik    | Semestri |
|---------------------------------------------------------------|----------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Organizacija (modul) | 3. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1153 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 30   | 0             | 0                    | 60              | 4    |

|                                   |              |
|-----------------------------------|--------------|
| <b>Nosilec predmeta/Lecturer:</b> | Robert Klinc |
|-----------------------------------|--------------|

|                                    |                   |
|------------------------------------|-------------------|
| <b>Vrsta predmeta/Course type:</b> | Izbirni strokovni |
|------------------------------------|-------------------|

|                          |                      |             |
|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b>                          |
|------------------------------------------------------------------------------|------------------------------------------------|
| Predmet je del modula Organizacija.                                          | The course is part of the module Organisation. |

| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Predavanja: definicija projekta; cilji projekta. Področja in procesi projektnega vodenja. Specifika in faze projektov v gradbeništvu. Metode in tehnike operativnega planiranja. Mrežno planiranje Optimizacije mrežnih planov z vidika virov in stroškov. Lokacijsko planiranje. Spremljanje in analiza realizacije projekta. Informacijski sistemi za podporo vodenju projektov v Gradbeništvu.</p> <p>Vaje: optimizacije mrežnih planov; uporaba programske opreme MS Project.</p> | <p>Lectures: definition of a project, project goals. Project management: Areas and processes. Project phases and specific features of construction projects. Methods and techniques of operational planning. Mesh planning. Plan optimisation from the viewpoint of costs and resources. location planning. Monitoring and analysis of project execution.</p> <p>Tutorials: optimisation of mesh plans. Practical use of MS Project software.</p> |



**Temeljna literatura in viri/Readings:**

Pšunder, M. 2009. Operativno planiranje. Maribor, Fakulteta za gradbeništvo.

Rant, M., Jeraj, M., Ljubič, T. 1998. Vodenje projektov. ORFIN Radovljica, str.1-142.

Česen, A., Kern, T., Bajec, M. 2008. Vodnik po znanju projektnega vodenja, 3. izdaja. Založba Moderna organizacija.

**Cilji in kompetence:****Cilji:**

- pridobiti osnovna znanja s področja vodenja in spremljanja projekta,
- pridobiti znanja za premostitev praznine med projektom in njegovo izvedbo.

**Predmetnospecifične kompetence:**

- obvladanje metod, tehnik in orodij za planiranje, vodenje in spremljanje projekta (npr. MS Project),
- zna uporabiti sodobno informacijsko tehnologijo,
- pridobi znanje in veščine za sodelovanje v skupini.

**Objectives and competences:****Objectives:**

- to obtain fundamental knowledge from the field of management and monitoring of projects,
- to obtain knowledge that bridges the project initiation and execution.

**Competences:**

- mastering of methods, techniques and tools for planning, management and monitoring of projects,
- ability to use the appropriate software used in practice,
- acquires knowledge and skills required in group work.

**Predvideni študijski rezultati:****Študent**

- bo sposoben samostojno pripraviti plan manjšega gradbenega projekta, pri čemer uporablja ustrezna sodobna računalniška orodja,
- bo sposoben uporabiti programsko opremo pri projektnem delu v praksi,
- bo sposoben povezovati pridobljena znanja s prakso.

**Intended learning outcomes:****Student**

- will be able to prepare independently small construction project plan, by using appropriate tools,
- will be able to use contemporary information technology,
- will be able to connect the acquired knowledge with real life case studies.

**Metode poučevanja in učenja:**

Predavanja in vaje na konkretnih primerih.

**Learning and teaching methods:**

Lectures and tutorial (case studies).

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                  |         |                              |
|------------------|---------|------------------------------|
| Računski izpit   | 40,00 % | Exam – practical examples    |
| Teoretični izpit | 30,00 % | Exam – theoretical part      |
| Zagovor vaj      | 30,00 % | Oral defence of the tutorial |



**Reference nosilca/Lecturer's references:**

KLINC, Robert, TURK, Žiga. Construction 4.0 - digital transformation of one of the oldest industries. Economic and business review. 2019, vol. 21, no. 3, str. 393-410, ilustr. ISSN 1580-0466.  
[http://ojs.ebrjournal.net/ojs/index.php/ebr/article/view/786/pdf\\_163](http://ojs.ebrjournal.net/ojs/index.php/ebr/article/view/786/pdf_163), <https://repozitorij.uni-lj.si/IzpisGradiva.php?id=114085&lang=slv>, DOI: 10.15458/ebr.92.

KLINC, Robert, DOLENC, Matevž, TURK, Žiga. Novi trendi na področju sodelovalnega inženirstva = New trends in collaborative engineering. Gradbeni vestnik : glasilo Zveze društev gradbenih inženirjev in tehnikov Slovenije. [Tiskana izd.]. nov. 2011, letn. 60, št. 11, str. 300-309, ilustr. ISSN 0017-2774.

, Robert, DOLENC, Matevž. Vpliv IT na produktivnost. Sistem : nove tehnologije za poslovni svet. [Tiskana izd.]. 2007, december, str. 12-14, barvne ilustr. ISSN 1318-9077.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                                |
|----------------------|------------------------------------------------|
| <b>Predmet:</b>      |                                                |
|                      | <b>UREJANJE STAVBNIH ZEMLJIŠČ IN CENILSTVO</b> |
| <b>Course title:</b> |                                                |
|                      | <b>BUILDING LAND DEVELOPMENT AND VALUATION</b> |

| Študijski programi in stopnja                                 | Študijska smer       | Letnik    | Semestri |
|---------------------------------------------------------------|----------------------|-----------|----------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Organizacija (modul) | 3. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1152 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 30   | 0             | 0                    | 60              | 4    |

|                                   |                                    |
|-----------------------------------|------------------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Maruška Šubic-Kovač, Daniel Kozelj |
|-----------------------------------|------------------------------------|

|                                    |                                         |
|------------------------------------|-----------------------------------------|
| <b>Vrsta predmeta/Course type:</b> | izbirni strokovni/Elective professional |
|------------------------------------|-----------------------------------------|

|                          |                      |             |
|--------------------------|----------------------|-------------|
| <b>Jeziki/Languages:</b> | Predavanja/Lectures: | Slovenščina |
|                          | Vaje/Tutorial:       | Slovenščina |

|                                                                              |                                                |
|------------------------------------------------------------------------------|------------------------------------------------|
| <b>Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:</b> | <b>Prerequisites:</b>                          |
| Predmet je del modula Organizacija.                                          | The course is part of the module Organisation. |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Temeljni pojmi na področju urejanja zemljišč in cenilstva; pridobivanje in urejanje stavbnih zemljišč kot poseg v zasebno lastnino; vrednotenje zemljišč in stroški povezani z urejanjem stavbnih zemljišč; potrebe in nameni vrednotenja nepremičnin; analiza trga nepremičnin; standardi vrednotenja nepremičnin; pojem nepremičnine, ocenjevane vrednosti in načini ocenjevanja teh vrednosti nepremičnin; izdelava cenitvenega poročila; množično vrednotenje nepremičnin; nepremičninski davki. | Basic definitions in the field of building land development and real estate valuation; building land acquisition and building land development as an interference with private property; valuation of building land and costs connected with building land development; the purpose of real estate valuation; real estate market analysis; real estate valuation standards; valuation subject, value and valuation approaches; real estate report; mass real estate valuation; real estate taxes. |

**Temeljna literatura in viri/Readings:**

Šubic Kovač, M. 2013. Vrednotenje nepremičnin. Študijsko gradivo, Ljubljana, UL FGG, 134 str.

Šubic Kovač, M. 1998. Vrednotenje stavbnih zemljišč. Ljubljana, UL FGG, 179 str.

Šubic Kovač, M. 1997. Ocenjevanje tržne vrednosti stavbnih zemljišč. Ministrstvo za pravosodje, RS, 94. str.

Harvey, J., 2000. Urban land economics, Izbrana poglavja. Palgrave, 436 str.

Veljavna zakonodaja s področja urejanja zemljišč. Dostopno na: <http://www.gov.si>.

**Cilji in kompetence:****Cilji:**

- seznaniti študenta s področjem urejanja stavbnih zemljišč ter cenilstva, še posebej vrednotenja zemljišč.

**Predmetnospecifične kompetence:**

- razumevanje procesa pridobivanja in urejanja zemljišč kot poseg v ustavno zagotovljeno zasebno lastnino,
- obvladovanje uporabe instrumentov zemljiške politike kot sredstvo izvedbe planiranega v prostorskih aktih,
- razumevanje in obvladovanje različnih načinov vrednotenja nepremičnin, še posebej stavbnih zemljišč, v skladu z veljavno zakonodajo in standardi,
- sposobnost komuniciranja z vsemi udeleženci na področju nepremičnin in vrednotenja nepremičnin v splošnem.

**Objectives and competences:****Objectives:**

- to familiarize student with building land development and real estate valuation with emphasis on building land valuation.

**Competences:**

- to understand the process of building land acquisition and building land development (as interference with private property),
- the ability to use instruments of land policy,
- the ability to use various methods of real estate valuation, especially methods of building land valuation in accordance with the law and standards,
- the ability to communicate with other participants in the field of real estate and real estate valuation.

**Predvideni študijski rezultati:****Študent**

- bo sposoben zbrati in analizirati podatke o nepremičninah in trgu nepremičnin,
- bo sposoben analizirati situacijo pri pridobivanju zemljišč za gradnjo, oceniti prednosti in slabosti posameznih načinov pridobivanja zemljišč za gradnjo in se odločiti o nadaljnjem postopku,
- bo sposoben kritično presojeti zakonsko in strokovno ustreznost posegov na področju urejanja stavbnih zemljišč,
- bo sposoben kritično analizirati poročilo o oceni vrednosti nepremičnine,

**Intended learning outcomes:****Student**

- will be able to acquire data and to analyze data on real estate and real estate market,
- will be able to analyze situation in the field of land acquiring for building purpose, to assess advantages and disadvantages of different land development and to decide on further action,
- will be able to critically review the legal and expert adequacy of interventions in the field of building land development,
- will be able to critically review the real estate report,
- will be able to use the acquired knowledge when preparing measures for the implementation of

|                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| - bo sposoben svoje znanje uporabiti pri pripravi strokovnih podlag pri izdelavi prostorskih aktov in pri njihovi izvedbi,<br>- bo sposoben svoje rezultate javno predstaviti pisno in ustno, sodelovati v interdisciplinarnih timih in komunicirati s strankami v postopkih. | spatial planning documents and in the process of making real estate report on their own,<br>- will be able to use national and international professional literature in the field of building land management and valuation, to make oral presentation of the results in front of the public and to participate in interdisciplinary teams in the field of land development and real estate valuation. |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                 |                                           |
|-------------------------------------------------|-------------------------------------------|
| Predavanja in vaje z uporabo video pripomočkov. | Lectures and tutorials using visual aids. |
|-------------------------------------------------|-------------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                                                                                |         |                                                                                               |
|--------------------------------------------------------------------------------|---------|-----------------------------------------------------------------------------------------------|
| Pisni izpit (teoretični in računski del, vsak del mora biti pozitivno ocenjen) | 70,00 % | Written exam (theoretical part, calculation exercises; each part must be assessed positively) |
| Samostojno izdelane vaje                                                       | 30,00 % | Individual coursework                                                                         |

**Reference nosilca/Lecturer's references:**

ŠUBIC KOVAČ, Maruška. Analysis of expert bases for levying municipal contribution in Slovenia, taking into account fundamental principles. V: HEPERLE, Erwin (ur.). Methods and concepts of land management : diversity, changes and new approaches, (European academy of land use and development - EALD). 1. Aufl. Zürich: Hochschulverlag. 2020, str. 293-306, ilustr. <https://vdf.ch/methods-and-concepts-of-land-management.html>, <https://www.research-collection.ethz.ch/handle/20.500.11850/445042>, doi: 10.3929/ethz-b-000445042. STOPAR, Iris, ŠUBIC KOVAČ, Maruška. Vrednotenje zemljišč v primeru stvarne služnosti : študija primera v Sloveniji = Land valuation in case of easement : the case study in Slovenia. Geodetski vestnik : glasilo Zveze geodetov Slovenije, ISSN 0351-0271. [Tiskana izd.], 2016, letn. 60, št. 4, str. 685-716, ilustr. [http://geodetski-vestnik.com/60/4/gv60-4\\_stopar.pdf](http://geodetski-vestnik.com/60/4/gv60-4_stopar.pdf), doi: 10.15292/geodetski-vestnik.2016.04.685-716.

ŠUBIC KOVAČ, Maruška. Acquisition of Land and Compensation in Infrastructure Projects in the Republic of Slovenia. V: HEPERLE, Erwin (ur.), LISEC, Anka (ur.). Opportunities and Constraints of Land Management in Local and Regional Development : Integrated Knowledge, Factors and trade-offs. 1. Aufl. Zürich: Hochschulverlag. 2018, str. 187-201. <https://www.research-collection.ethz.ch/handle/20.500.11850/289657>.

KAFOL STOJANOVIĆ, Ajda, KOZELJ, Daniel, ŠUBIC KOVAČ, Maruška. Assessment of water distribution system capacity as settlement-development decision-making expert basis at the local level = Ocena zmogljivosti vodovodnega sistema kot strokovna podlaga za odločanje o usmerjanju razvoja naselij na lokalni ravni. Geodetski vestnik : glasilo Zveze geodetov Slovenije, ISSN 0351-0271. [Tiskana izd.], 2020, letn. 64, št. 3, str. 389-401, ilustr.

KOZELJ, Daniel, RAK, Gašper, ŠKERJANEC, Mateja, ČENČUR CURK, Barbara, TORKAR, Anja, VALENČIČ, Urška, BRAČIČ-ŽELEZNIK, Branka, SIMONETI, Maja, LUKŠIČ, Andrej, VILHAR, Urša, KOZAMERNIK, Erika, JANŽA, Mitja, VAHTAR, Marta. Camaro-D : sodelovanje deležnikov pri uvajanju naprednih praks gospodarjenja s prostorom z vidika vplivov na vodni režim v povodju Donave : slovensko pilotno območje: Iška in Iški vršaj na Ljubljanskem barju - napajalno območje vodarne Brest. Ljubljana: Fakulteta za gradbeništvo in geodezijo: Naravoslovnotehniška fakulteta: Vodovod kanalizacija snaga, 2019. 51 str., ilustr.

RAK, Gašper, ŠKERJANEC, Mateja, BRAČIČ-ŽELEZNIK, Branka, KOZELJ, Daniel. Vpliv spremembe rabe tal na poplavno nevarnost in oskrbo z vodo = Impact of land use changes on flood risk and water supply. Ujma : revija za vprašanja varstva pred naravnimi in drugimi nesrečami, ISSN 0353-085X, 2019, št. 33, str. 168-178, ilustr.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                |
|----------------------|----------------|
| <b>Predmet:</b>      |                |
|                      | <b>PROMET</b>  |
| <b>Course title:</b> |                |
|                      | <b>TRAFFIC</b> |

**Študijski programi in stopnja** **Študijska smer** **Letnik** **Semestri**

Operativno gradbeništvo, prva stopnja, visokošolski strokovni Promet (modul) 3. letnik Zimski

**Univerzitetna koda predmeta/University course code:** 1157

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 0    | 30            | 0                    | 60              | 4    |

**Nosilec predmeta/Lecturer:** Rok Marsetič

**Vrsta predmeta/Course type:** Izbirni strokovni /Elective professional

**Jeziki/Languages:**

|                      |             |
|----------------------|-------------|
| Predavanja/Lectures: | Slovenščina |
| Vaje/Tutorial:       | Slovenščina |

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

**Prerequisites:**

Predmet je del modula Promet.

Part of the module Traffic.

**Vsebina:**

**Content (Syllabus outline):**

Osnovni parametri prometnega toka. Osnovne zakonitosti prometnega toka. Modeli za izračun posameznih projektnih rešitev. Kapacitete prometnih površin. Osnove prometnega planiranja. Osnove teorije stredbe v prometu.

Basics of traffic flow parameters. Basic principles of traffic flow theory. Models for calculating individual road infrastructure project solutions. Capacities of individual road infrastructure project solutions. Fundamentals of transport planning. Basics of queuing theory of transport facilities.

**Temeljna literatura in viri/Readings:**

Maher, T. 2006. Teorija prometnega toka, osnutek skripta. 164 strani.

Maher, T. 2006. Kapaciteta prometnih objektov, osnutek skripta, 133 strani.

Highway Capacity Manual, HCM2000 (na CD v knjižnici UL FGG). 2004. Washington, ZDA, 421 str.

**Cilji in kompetence:****Cilji:**

- seznaniti se z osnovnimi parametri prometnega toka, osnovnimi zakonitostmi prometnega toka in spoznati modele za izračun posameznih projektnih rešitev. Predmetnospecifične kompetence,
- razumevanje osnov prometnega planiranja,
- razumevanje in obvladovanje osnove teorije strežbe v prometu,
- spoznavanje in obvladovanje dela z računalniškimi orodji iz navedenih področij.

**Objectives and competences:****Competences:**

- understanding the basics of transport planning,
- understanding and managing the basics of the queuing theory of facilities in transportation,
- understanding and managing work with computer tools from these areas.

**Predvideni študijski rezultati:****Študent**

- bo sposoben izdelati osnovne analize iz navedenih področij,
- bo sposoben presoјati medsebojni vpliv prometnega toka in projektnih rešitev v cestogradnji v smislu zmogljivih, varnih in ekonomičnih rešitev,
- bo sposoben opredeliti faktorje, ki vplivajo na optimalno, varno in ekonomično dogajanje v prometu,
- bo sposoben v projektu identificirati in rešiti določen problem.

**Intended learning outcomes:****Student**

- will be able to create basic analysis of these areas,
- will be able to assess the interaction between traffic flow and design solutions in road construction in terms of performance, safe and economical solution,
- will be able to define factors that affect optimum, safe and economic developments in transport,
- will be able to identify and to solve problems in the project.

**Metode poučevanja in učenja:**

Predavanja in laboratorijske vaje.

**Learning and teaching methods:**

Lectures, tutorials and laboratory work.

**Načini ocenjevanja:****Delež/Weight****Assessment:**

Pisni in/ali ustni izpit – teorija

50,00 %

Theory - written and / or oral exam

Vaje - priprava seminarske naloge in zagovor

50,00 %

Exercises - preparation of seminary work and defence

**Reference nosilca/Lecturer's references:**

RIJAVEC, Robert, DADASHZADEH, Nima, ŽURA, Marijan, MARSETIČ, Rok. Park and pool lots' impact on promoting shared mobility and carpooling on highways - the case of Slovenia : 3188 - OA article. Sustainability. 2020, letn. 12, št. 8, str. 1-19, ilustr. ISSN 2071-1050. <https://www.mdpi.com/2071-1050/12/8/3188>, DOI: 10.3390/su12083188.

ŠEMROV, Darja, MARSETIČ, Rok, ŽURA, Marijan, TODOROVSKI, Ljupčo, SRDIČ, Aleksander. Reinforcement learning approach for train rescheduling on a single-track railway. Transportation research. Part B, Methodological. [Print ed.]. 2016, letn. 86, št. apr., str. 250-267, ilustr. ISSN 0191-2615. DOI: 10.1016/j.trb.2016.01.004.

MARSETIČ, Rok, ŠEMROV, Darja, ŽURA, Marijan. Road artery traffic light optimization with use of reinforcement learning. Promet. [Print ed.]. 2014, letn. 26, št. 2, str. 101-108. ISSN 0353-5320.



## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                          |
|----------------------|------------------------------------------|
| <b>Predmet:</b>      |                                          |
|                      | <b>GEOTEHNIKA PROMETNIC</b>              |
| <b>Course title:</b> |                                          |
|                      | <b>GEOTECHNICS OF TRAFFIC STRUCTURES</b> |

**Študijski programi in stopnja** **Študijska smer** **Letnik** **Semestri**

|                                                               |                |           |       |
|---------------------------------------------------------------|----------------|-----------|-------|
| Operativno gradbeništvo, prva stopnja, visokošolski strokovni | Promet (modul) | 3. letnik | Letni |
|---------------------------------------------------------------|----------------|-----------|-------|

**Univerzitetna koda predmeta/University course code:**

1156

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 0    | 30            | 0                    | 60              | 4    |

**Nosilec predmeta/Lecturer:**

Janko Logar

**Vrsta predmeta/Course type:**

Izbirni strokovni /Elective professional

**Jeziki/Languages:**

Predavanja/Lectures:

Slovenščina

Vaje/Tutorial:

Slovenščina

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

Predmet je del modula Promet. Pogoj za vključitev v delo so opravljeni izpiti iz predmetov Osnove mehanike tal, Geotehnične gradnje.

**Prerequisites:**

The course is part of the module Traffic.  
Prerequisites: Passed exams in Fundamentals of soil mechanics and Geotechnical constructions.

**Vsebina:**

**Content (Syllabus outline):**

Podporne konstrukcije na prometnicah; metode izboljšanja tal; geosintetiki pri gradnji prometnic; geotehnični vidiki gradnje spodnjega in zgornjega ustroja prometnic; osnove mehanike kamnin in vkopi v kamninah; odvodnjavanje, dreniranje prometnic; osnove predorogradnje.

Retaining structures along roads and railways; methods of ground improvement; use of geosynthetics in road construction; sub-grade and sub-base of roads and railways; fundamentals of rock mechanics, cuts in rock; drainage and dewatering of roads and railways; fundamentals of tunnelling.

**Temeljna literatura in viri/Readings:**

Logar, J., Majes, B. 2011. Skripta za predmet Geotehnika prometnic, 85 str.

Tehnične specifikacije za ceste. 2004. Ljubljana, DRSC, 228 strani.

SIST EN 1997-1, Geotehnično projektiranje – 1. del: Splošna pravila, 2006., 148 str.

Učno gradivo v spletni učilnici.

**Cilji in kompetence:****Cilji:**

- spoznati posebnosti geotehnike, ki se pojavljajo pri gradnji prometnih objektov, še predvsem način izboljšanja tal, uporaba geosintetikov, vkopi v kamninah, osnove gradnje predorov, geotehnični vidiki gradnje spodnjega in zgornjega ustroja prometnic, prehodi prometnic na objekte, podporne konstrukcije.

**Predmetnospecifične kompetence:**

- študent pozna principe načrtovanja in kontrole gradnje cest in železnic, načrtovanja podpornih konstrukcij ter geotehničnega načrtovanja izboljšave tal ter vkopov v kamninah.

**Objectives and competences:****Objectives:**

- to study those fields of geotechnical engineering that are of interest in construction of roads and railways as ground improvement use of geosynthetics, cuts in rock, basics of tunnel construction, geotechnical issues of sub-base and sub-grade construction, transition from embankment to bridge and retaining structures.

**Competences:**

- student knows the principles of the design and construction control for roads and railways, design of retaining structures, geotechnical design of cuts in rock and design of soil improvement.

**Predvideni študijski rezultati:****Študent**

- bo sposoben sodelovati pri pripravi geotehniške dokumentacije,

- bo sposoben uporabiti enačbe in postopke za računske analize izboljšanja tal, za načrtovanje podpornih konstrukcij, vkopov v kamninah, za načrtovanje odvodnjavanja prometnic,

- bo sposoben uporabiti računalniške programe za analizo stabilnosti kamnin in kontrolo zemeljskih del pri gradnji prometnic.

**Intended learning outcomes:****Student**

- will be able to participate in the preparation of ground investigation reports and geotechnical design reports,

- will be able to use methods for design of soil improvement, retaining structures, cuts in rock, drainage along roads and railways,

- will be able to use software to analyze the stability and methods for the control of earthworks in road and railway construction.

**Metode poučevanja in učenja:**

Predavanja, vaje, samostojno delo, ekskurzija.

**Learning and teaching methods:**

Lectures, tutorials, individual work, field trip.

**Načini ocenjevanja:****Delež/Weight****Assessment:**

2 kolokvija ali računski del zpira

70,00 %

Two mid-term exams or practical part of exam

|                       |         |                          |
|-----------------------|---------|--------------------------|
| Teoretični del izpita | 30,00 % | Theoretical part of exam |
|-----------------------|---------|--------------------------|

**Reference nosilca/Lecturer's references:**

KLOPČIČ, Jure, LOGAR, Janko. Vpliv anizotropije hribinske mase na velikost in smer pomikov zaradi izkopa predora = Influence of anisotropy of rock mass on magnitude and direction of displacements due to tunnelling. Gradb. vestn., jan. 2013, letn. 62, str. 3-14.

PULKO, Boštjan, MAJES, Bojan, LOGAR, Janko. Geosynthetic-encased stone columns - analytical calculation model. Geotext. geomembr.. [Print ed.], feb. 2011, letn. 29, št. 1, str. 29-39.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                         |
|----------------------|-----------------------------------------|
| <b>Predmet:</b>      |                                         |
|                      | <b>INTELIGENTNI TRANSPORTNI SISTEMI</b> |
| <b>Course title:</b> |                                         |
|                      | <b>INTELLIGENT TRANSPORT SYSTEMS</b>    |

**Študijski programi in stopnja** **Študijska smer** **Letnik** **Semestri**

Operativno gradbeništvo, prva stopnja, visokošolski strokovni

Promet (modul)

3. letnik

Letni

**Univerzitetna koda predmeta/University course code:**

1158

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 0    | 30            | 0                    | 60              | 4    |

**Nosilec predmeta/Lecturer:**

Rok Marsetič

**Vrsta predmeta/Course type:**

izbirni strokovni/Elective professional

**Jeziki/Languages:**

Predavanja/Lectures:

Slovenščina

Vaje/Tutorial:

Slovenščina

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

**Prerequisites:**

Predmet je del modula Promet.

The course is part of the module Traffic.

**Vsebina:**

**Content (Syllabus outline):**

Nadgradnja splošnih znanj o teoriji prometnega toka in prometnem planiranju. Opazovanje prometa, merilne naprave v cestnem prometu.

Upgrading of general knowledge on the traffic flow theory and transportation planning. Traffic Flow Observation, traffic flow parameters measurements.

Sistemi vodenja prometa na medmestni prometni mreži, sistem posredovanja prometnih informacij (dinamično vodenje po cestni mreži) oziroma aktivni dinamični sistemi povečanja propustnosti ceste. Cestno-vremenski informacijski sistem in zimska služba, meteorološka stanja vozišča. Sistemi elektronskega plačevanja in cestninjenja. Sistemi upravljanja prometa v mestih, cestna problematika v naseljih, prometni režimi, prometna signalizacija in oprema v naseljih. Naprave za umirjanje prometa v

Urban and Inter city Traffic Management systems. System for the transmission of traffic information (dynamic management of the road network). Road-Weather Information System and winter service. Meteorological status of the road. Electronic payment and toll collection systems. Traffic management systems in urban areas, road problems in urban areas, traffic arrangements, traffic control equipment in urban areas. Devices for traffic calming in residential areas. Parking lots and garages,

|                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| naselijh. Parkirišča in garažne hiše, sistem vodenja in plačevanja parkiranja, potrebe po parkirnih površinah. Sistemi vodenja blagovnega prometa, tehtanje vozil. Sistemi storitev v javnem prometu, avtobusna postajališča. Prometna signalizacija in prometna oprema. Sistemi za upravljanje z izrednimi dogodki, dela na cesti. Promet in okolje. | management system and parking fee payment systems for the parking areas. Freight transport management systems, weigh-in motion systems. Public transport system stops. Traffic signs and equipment. Systems for managing incidents, road works. Transport and the environment. |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Temeljna literatura in viri/Readings:**

Izbrana poglavja iz:

Kastelic, T. et.al. 1991. Tehnični normativi za projektiranje in opremo mestnih prometnih površin, FAGG-PTI, Poglavje XIV, 95 strani.

Žura, M. et.al. 2006. SITSA – Slovenska ITS arhitektura: Aktualni razvoj ITS, FGG-PTI, 207 strani.

Highway Capacity Manual, HCM2000, Washington, ZDA, 2000, 421 strani.

**Cilji in kompetence:**

Cilji:

- spoznati osnovne pojme upravljanja prometa in inteligentnih transportnih sistemov in storitev (ITS).

Predmetnospecifične kompetence:

- obvladovanje določanja potrebnih parametrov za dimenzioniranje cest in križišč, ter kriterijev za uporabo ITS,

- usposobljenost za izdelovanje projektov iz področja prometnih gradenj in avtomatskega vodenega prometa.

**Objectives and competences:**

Objectives:

- to learn about the basic concepts of intelligent transport systems and services (ITS).

Competences:

- to be able to define, measure and/or calculate necessary parameters for different ITS, evaluate criteria for different system introduction,

- to prepare ITS projects in the areas of transportation engineering and automated guided transport.

**Predvideni študijski rezultati:**

Študent

- bo sposoben uporabljati ITS kot ukrep pri optimizaciji upravljanja prometa na prometni infrastrukturi oziroma kot ukrep izkoriščanja obstoječe prometne infrastrukture, to je predvsem brez ali z minimalnim vložkom v novogradnje,

- bo sposoben identificirati faktorje, ki vplivajo na optimalno, varno in ekonomično dogajanje v prometu,

- bo sposoben zbrati in obdelati parametre prometnega toka na terenu in določiti odvisnosti med njimi za dimenzioniranje odprte ceste in za dimenzioniranje samostojnega križišča oziroma za potencialno uvedbo ITS.

**Intended learning outcomes:**

Student

- will be able to use ITS as a measure for the optimization of managing traffic on transport infrastructure or as a measure for the exploitation of existing transport infrastructure, especially with no or with minimal investment in new infrastructure,

- will be able to identify factors that affect optimum, safe and economic developments in transport,

- will be able to collect and process parameters of traffic flow in the field and determine dependencies between them for the design of rural roads and intersections, or for potential deployment of ITS.

**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                    |                                       |
|------------------------------------|---------------------------------------|
| Predavanja, vaje, samostojno delo. | Lectures, tutorials, individual work. |
|------------------------------------|---------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                                    |         |                                                  |
|------------------------------------|---------|--------------------------------------------------|
| Pisni in/ali ustni izpit - teorija | 50,00 % | Written and / or oral exam - theory              |
| Vaje in zagovor                    | 50,00 % | Exercises and written and/or oral exam (defence) |

**Reference nosilca/Lecturer's references:**

RIJAVEC, Robert, DADASHZADEH, Nima, ŽURA, Marijan, MARSETIČ, Rok. Park and pool lots' impact on promoting shared mobility and carpooling on highways - the case of Slovenia : 3188 - OA article. Sustainability. 2020, letn. 12, št. 8, str. 1-19, ilustr. ISSN 2071-1050. <https://www.mdpi.com/2071-1050/12/8/3188>, DOI: 10.3390/su12083188.

ŠEMROV, Darja, MARSETIČ, Rok, ŽURA, Marijan, TODOROVSKI, Ljupčo, SRDIČ, Aleksander. Reinforcement learning approach for train rescheduling on a single-track railway. Transportation research. Part B, Methodological. [Print ed.]. 2016, letn. 86, št. apr., str. 250-267, ilustr. ISSN 0191-2615. DOI: 10.1016/j.trb.2016.01.004.

MARSETIČ, Rok, ŠEMROV, Darja, ŽURA, Marijan. Road artery traffic light optimization with use of reinforcement learning. Promet. [Print ed.]. 2014, letn. 26, št. 2, str. 101-108. ISSN 0353-5320.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                            |
|----------------------|--------------------------------------------|
| <b>Predmet:</b>      |                                            |
|                      | <b>PROJEKTIRANJE IN GRADNJA ŽELEZNIC</b>   |
| <b>Course title:</b> |                                            |
|                      | <b>DESIGN AND CONSTRUCTION OF RAILWAYS</b> |

**Študijski programi in stopnja** **Študijska smer** **Letnik** **Semestri**

Operativno gradbeništvo, prva stopnja, visokošolski strokovni

Promet (modul)

3. letnik

Letni

**Univerzitetna koda predmeta/University course code:**

1159

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 0    | 30            | 0                    | 60              | 4    |

**Nosilec predmeta/Lecturer:**

Darja Šemrov

**Vrsta predmeta/Course type:**

izbirni strokovni/Elective professional

**Jeziki/Languages:**

Predavanja/Lectures:

Slovenščina

Vaje/Tutorial:

Slovenščina

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

**Prerequisites:**

Predmet je del modula Promet.

The course is part of the module Traffic.

**Vsebina:**

**Content (Syllabus outline):**

Uvod: splošno o prometu, okoljski vplivi prometa, zgodovina razvoja železniškega prometa, trajnostni transport in mobilnost ter trajnostna gradnja železniške infrastrukture.

Introduction: general information about transport, the impact of transport on the environment, the history of railway transport, sustainable transport and mobility, and sustainable railway infrastructure.

Splošno o železniškem sistemu - zakonodaja, organiziranost: država, varnostni organ, upravljavec, priglašeni organi, nadzor.

General information about the railway system: legislation and organizational aspect: state, safety authority, operator, notified bodies, supervision.

Zgornji ustroj: elementi ZU (tirnice, pritrdilni in vezni pribor, pragovi) in njihov transport, skladiščenje in vgradnja.

Upper structure: elements (rails, fastening system, sleepers) and their transport, storage, and installation.

Spodnji ustroj: elementi SU (navezana nosilna plast, nasip/usek, premostitveni objekti, peroni, nivojski

Substructure: elements (subgrade, embankment/cut, bridges, platforms, level crossings,

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| <p>prehodi, predori) in njihove dimenzije, vgradnja in vzdrževanje.</p> <p>Orodja in mehanizacija (naprava za rezanje tirnic, naprava za brušenje tirnic, varjenje tirnic, naprava za pritrdjevanje pritrdilnega pribora, stroj za planiranje tirne grede).</p> <p>Umeščanje železniške infrastrukture v prostor: prostorski in okoljski vidiki in pogoji umeščanja trase v prostor ob upoštevanju tehničnih parametrov.</p> <p>Trajnostno izvajanje del na železniški infrastrukturi (sodobni organizacijski postopki in orodja ter organizacija gradbišča, da so vplivi na okolje v času gradnje čim manjši).</p> | <p>tunnels) and their dimensions, installation, and maintenance.</p> <p>Tools and machines (rail cutter, rail grinding machines, railing welding device, device for attaching fastening accessories, tamping machines).</p> <p>Designing of railway infrastructure: spatial and environmental aspects and conditions for railway project designs were also technical requirements that must be met.</p> <p>Sustainable implementation of the works on the railway infrastructure (modern organisational procedures and tools, as well as organization of the construction site to minimize the environmental impact during the construction works).</p> |
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### Temeljna literatura in viri/Readings:

Izbrana poglavja iz:

Zgonc, B. 1996. Železnice I. projektiranje, gradnja in vzdrževanje prog., Ljubljana, Univerza v Ljubljani FGG, 225 str.

Zgonc, B. 2003. Železniški promet. Portorož, Univerza v Ljubljani, Fakulteta za pomorstvo in promet, str. 3-42, 105-130.

Zgonc, B., Verlič, P., Šemrov, D. 2022. Železniški tir: zgornji ustroj in elementi trase. Portorož, Univerza v Ljubljani, Fakulteta za pomorstvo in promet.

Predpisi in standardi s področja železniške infrastrukture.

### Cilji in kompetence:

Cilji:

- razumeti osnovne značilnosti železniškega sistema kot trajnostne oblike mobilnosti, njenih podsistemov in komponent ter vpliva prometa, predvsem železniškega, na okolje.

Predmetnospecifične kompetence:

- študent spozna sestavne dele železniške infrastrukture in zakonitosti celostnega načrtovanja konvencionalnih železniških prog pri čemer bosta poleg tehničnih parametrov upoštevana tudi ekološki in družbeni vidiki umeščanja proge v prostor,

- razumevanje in obvladovanje tehničnih, tehnoloških, organizacijskih in ekoloških izzivov v procesih povezanih z železniškimi prometnimi storitvami in javno železniško infrastrukturo na konvencionalnih železniških progah,

### Objectives and competences:

Objectives:

- to understand the basic characteristics of the railway system as a sustainable form of mobility, its subsystems and components, and the impact of transport, particularly the railway, on the environment.

Competences:

- the student learns about the components of the railway infrastructure and the principles of integrated planning of conventional railway lines, taking into account not only the technical parameters but also the environmental and social aspects of placing the railway in space,

- understanding and managing technical, technological, organisational, and environmental challenges in processes related to railway transport



|                                                                                                     |                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| - obvladovanje sodobne informacijske tehnologije na področju infrastrukture v železniških sistemih. | services and public railway infrastructure on conventional railway lines,<br><br>- understanding and use of modern information technology in the field of infrastructure in railway systems. |
|-----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Študent</b><br><br>- bo sposoben pojasniti tehnične, tehnološke, organizacijske in okoljske probleme v procesih, povezanih z železniškim sistemom in storitvami,<br><br>- bo sposoben kritične presoje posameznega problema in sodelovati pri sprejemanju odločitev,<br><br>- bo sposoben uporabiti sodobno (digitalno) tehnologijo za analizo vplivov umeščanja proge v prostor v fazi projektiranja, gradnje in vzdrževanja javne železniške infrastrukture. | <b>Student</b><br><br>- will be able to explain technical, technological, organizational, and environmental problems in processes related to the railway system and services,<br><br>- will be able to critically evaluate individual problems and participate in decision-making processes,<br><br>- will be able to use modern (digital) technology to analyze the impact of track laying during phases of design, construction, or maintenance of public railway infrastructure. |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Metode poučevanja in učenja:****Learning and teaching methods:**

|                     |                                       |
|---------------------|---------------------------------------|
| Predavanja in vaje. | Lectures and exercises in laboratory. |
|---------------------|---------------------------------------|

**Načini ocenjevanja:****Delež/Weight****Assessment:**

|         |         |          |
|---------|---------|----------|
| Teorija | 60,00 % | Theory   |
| Vaje    | 40,00 % | Tutorial |

**Reference nosilca/Lecturer's references:**

ŠEMROV, Darja, MARSETIČ, Rok, ŽURA, Marijan, TODOROVSKI, Ljupčo, SRDIČ, Aleksander. Reinforcement learning approach for train rescheduling on a single-track railway. Transportation research. Part B, Methodological, ISSN 0191-2615. [Print ed.], 2016, letn. 86, št. apr., str. 250-267.

ZGONC, Bogdan, VERLIČ, Peter, ŠEMROV, Darja. Železniški tir : zgornji ustroj in elementi trase. Portorož: Fakulteta za pomorstvo in promet, 2022. XXVII, 428 str.

ŠEMROV, Darja, LEBAN, Leon. Structure gauge represented as a BIM model. V: STAMENKOVIĆ, Dušan (ur.), BANIĆ, Milan (ur.). Proceedings, XVIII Scientific-Expert Conference on Railways - RAILCON '18, October 11-12, 2018, Niš. Niš: Faculty of Mechanical Engineering. 2018, str. 205-208.

SCHÖBEL, Andreas, ŠEMROV, Darja. Simulation of railway operation under ETCS. V: RIJAVEC, Robert (ur.), et al. Linking people with ITS : proceedings, 20th International Symposium on Electronics in Transport [being] ISEP 2012, March 26-27, 2012, Ljubljana, Slovenia. Ljubljana: Electrotechnical Association of Slovenia: Slovensko društvo za inteligentne transportne sisteme. 2012, str. 1-4.