

## Učni načrti

Univerzitetni študijski program prve stopnje

**GEODEZIJA IN GEOINFORMATIKA (UN)**

## Course Syllabi

1<sup>st</sup> Cycle Academic Study Programme

**GEODESY AND GEOINFORMATION (BA)**

Velja od 2024/2025 | Valid from 2024/2025

Veljavni študijski program na dan 29. 1. 2024 | Valid study programme at January 29, 2024

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## UČNI NAČRT PREDMETA/COURSE SYLLABUS

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

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 1. letnik | Zimski   |

Univerzitetna koda predmeta/University course code:

1629

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 75         | 0       | 75   | 0             | 0                    | 150             | 10   |

Nosilec predmeta/Lecturer:

Marjeta Kramar Fijavž, Gašper Jaklič

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):

- Množice in preslikave: operacije z množicami, definicijsko območje, zaloga vrednosti, enakost preslikav, kompozitum, graf, injektivnost, surjektivnost, bijektivnost, inverzna preslikava.
- Naravna, realna in kompleksna števila: princip popolne indukcije, natančna spodnja in natančna zgornja meja (*inf* in *sup*), absolutna vrednost, kompleksna števila: geometrijska predstavitev, računske operacije, polarni zapis, de Moivreova formula, osnovni izrek algebre.
- Geometrijski vektorji: vsota, produkt s skalarjem, linearna kombinacija, linearna neodvisnost, baza, skalarni produkt, vektorski

- Sets and mappings: operations with sets, domain, range, equality of maps, composition, graph, injectivity, surjectivity, bijectivity, inverse map.
- Natural, real and complex numbers: induction principle, exact upper and lower bound (*inf* and *sup*), absolute value, complex numbers: geometric representation, operations, polar form, de Moivre formula, fundamental theorem of algebra.
- Geometric vectors: sum, product with scalars, linear combination, linear independence, basis,

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| <p>produkt, mešani produkt, analitična geometrija v prostoru.</p> <ul style="list-style-type: none"> <li>Številska zaporedja in vrste: omejenost in konvergenca, Cauchyjev kriterij, limita, računska pravila, konvergenca številске vrste, geometrijska in harmonična vrsta, konvergenčni kriteriji.</li> <li>Limita in zveznost funkcije realne spremenljivke: limita funkcije v dani točki, računska pravila, posplošene limite, asimptota, zveznost funkcije, lastnosti zveznih funkcij na zaprtem omejenem intervalu.</li> <li>Odvedljivost funkcije realne spremenljivke: definicija odvoda, tangenta na graf funkcije, računska pravila, Rolleov in Lagrangeov izrek, stacionarne točke in lokalni ekstremi, globalni ekstrem na zaprtem intervalu, l'Hospitalovo pravilo, višji odvodi, Taylorjeva formula, diferencial, konkavnost, konveksnost, prevoj, risanje grafov funkcije.</li> <li>Matrike: matrične operacije, inverzna matrika, matrični zapis sistema linearnih enačb, struktura rešitev, Gaussova metoda eliminacije, matrične enačbe, determinante, lastne vrednosti in lastni vektorji, karakteristični polinom, diagonalizacija.</li> <li>Integral funkcije realne spremenljivke: določen integral, Riemannova vsota, integrabilnost, lastnosti, Newton-Leibnizov izrek, primitivna funkcija, nedoločen integral, uvedba nove spremenljivke, integracija po delih (per partes), posplošeni (izlimitirani) integral, uporaba določenega integrala.</li> <li>Potenčne vrste: konvergenčni polmer, odvajanje, integriranje.</li> </ul> | <p>scalar product, vector product, mixed product, analytic geometry.</p> <ul style="list-style-type: none"> <li>Numerical sequences and series: boundedness and convergence, Cauchy criterium, limit, computation rules, convergence of a series, geometric and harmonic series, convergence criteria.</li> <li>Limit and continuity of functions of one real variable: limit of a function at a given point, computation rules, generalized limits, asymptotae, continuity of a function, properties of continuous functions on closed bounded interval.</li> <li>Derivative of functions of one real variable: definition, tangent on a graph of a function, computation rules, theorem of Rolle and Lagrange, stationary points and local extrema, global extremum on a closed interval, l'Hospital rule, higher derivatives, Taylor formula, differential, concavity, convexity, inflection point, plotting graphs.</li> <li>Matrices: matrix operations, inverse matrix, matrix form of a system of linear equations, structure of solutions, Gauss elimination method, matrix equations, determinant, eigenvalues and eigenvectors, characteristic polynomial, diagonalization.</li> <li>Integral of functions of one real variable: definite integral, Riemannian sum, integrability, properties, Newton-Leibniz formula, primitive function, indefinite integral, substitution, integration by parts (per-partes), application of definite integral.</li> <li>Power series: convergence radius, derivation, integration.</li> </ul> |
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**Temeljna literatura in viri/Readings:**

Foerster, G.O. 1984. Analysis 1 Vieweg Studium.

Kolar, M.B. 1996. Zgrablić, Več kot nobena, a manj kot ... rešena naloga iz LA. Ljubljana. Pedagoška fakulteta.

Lampret, V. 2012. Matematika 1 - prvi del: Preslikave, števila in vektorski prostori. Ljubljana, UL FGG.

Leon, S. J. 2006. Linear Algebra with Applications, Prentice Hall, Pearson International Edition.

Mizori-Oblak, P. 1987. Matematika za študente tehnike in naravoslovja I. Ljubljana, UL FS.

Vidav, I. 1973. Višja matematika I, II. Ljubljana. DMFA Slovenije.

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

- podati osnovna znanja, na katerih lahko grade strokovni predmeti,
- zagotoviti obvladovanje osnovnih računskih veščin,

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

- to provide general basic knowledge for the engineering courses,
- to ensure mastering of basic computational skills,

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| <ul style="list-style-type: none"> <li>• omogočiti razumevanje matematičnega aparata, ki ga uporabljajo strokovni predmeti.</li> </ul> <b>Pridobljene kompetence:</b> <ul style="list-style-type: none"> <li>• sposobnost abstraktne formulacije konkretnih problemov,</li> <li>• krepiti smisel za sistematičnost, jasnost in preciznost formulacij,</li> <li>• razvijanje matematičnega mišljenja -</li> <li>• sklepanje od splošnega k posebnemu in obratno</li> </ul> | <ul style="list-style-type: none"> <li>• to enable understanding of mathematical tools used by engineering courses.</li> </ul> <b>Gained competences:</b> <ul style="list-style-type: none"> <li>• to be able of abstract formulation of practical problems,</li> <li>• to improve the capacity to establish systematical, clear and precise formulation,</li> <li>• to develop mathematical thinking - reasoning from general to special and vice versa.</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 osnovnih znanj iz algebre geometrijskih vektorjev, linearne algebre in iz matematične analize,</li> <li>• obvladovanje osnovnih računske spretnosti,</li> <li>• doseženo matematično znanje uporabljajo strokovni predmeti in omogoča nadaljevanje študija matematike, ki jo uporablja tehnika,</li> <li>• sposobnost abstraktne formulacije konkretnih problemov,</li> <li>• spretnost sistematičnega, jasnega in preciznega formuliranja problemov,</li> <li>• sposobnost sklepanja od splošnega k posebnemu in obratno,</li> <li>• spretnost uporabe literature.</li> </ul> | <ul style="list-style-type: none"> <li>• Basic knowledge and understanding of the algebra of geometric vectors, linear algebra and mathematical analysis,</li> <li>• mastering basic computational skills,</li> <li>• the achieved mathematical knowledge is used by the engineering courses and enables the study of mathematics used in technology,</li> <li>• ability of abstract formulation of practical problems,</li> <li>• capability of systematical, clear and precise formulation of problems,</li> <li>• ability of reasoning from general to special and vice versa,</li> <li>• skills in using literature.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                      |                                               |
|------------------------------------------------------|-----------------------------------------------|
| Predavanja, seminarske vaje, konzultacije, internet. | Lectures, tutorials, consultations, internet. |
|------------------------------------------------------|-----------------------------------------------|

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

|                                 |         |                         |
|---------------------------------|---------|-------------------------|
| Računske 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, LAKNER, Mitja, ŠKAPIN-RUGELJ, Marjeta. An equal-area method for scalar conservation laws. The Anziam journal, 2012, vol. 53, iss. 2, str. 156-170. Dostopno na: <http://dx.doi.org/10.1017/S1446181112000065>.

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.

SKUBIC, Blaž, LAKNER, Mitja, PLAZL, Igor. Sintering behavior of expanded perlite thermal insulation board: modeling and experiments. Ind. eng. chem. res. [Print ed.], 9. jul. 2013, vol. 52, no. 30, str. 10244-10249, ilustr. doi: 10.1021/ie400196z. Dostopno na: <http://pubs.acs.org/doi/ipdf/10.1021/ie400196z>.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                            |
|----------------------|----------------------------|
| <b>Predmet:</b>      |                            |
|                      | <b>FIZIKA ZA GEODEZIJO</b> |
| <b>Course title:</b> |                            |
|                      | <b>PHYSICS FOR GEODESY</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 1. letnik | Zimski   |

|                                                            |         |
|------------------------------------------------------------|---------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 0643055 |
|------------------------------------------------------------|---------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 75         | 15      | 45   | 0             | 0                    | 135             | 9    |

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

|                                    |                                     |
|------------------------------------|-------------------------------------|
| <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> |
|                                                                              |                       |

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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <ul style="list-style-type: none"> <li>Merske napake(*); kinematika; Newtonovi zakoni, statika, dinamika; pospeškometer(*); gibalna in vrtilna količina; delo, moč, energija; relativno gibanje: Coriolisova sila (*)</li> <li>gravitacija: Keplerjevi zakoni, Newtonov gravitacijski zakon, potencialna energija, gibanje satelitov; plimovanje, gibanje nebesnih teles(*);</li> <li>nihanje in valovanje;</li> <li>zgradba snovi; deformacije; mirujoče tekočine: težni tlak(*), manometri, vzgon;</li> <li>temperatura: razteznost, plinska enačba;</li> </ul> | <ul style="list-style-type: none"> <li>Physics and measurements (*); kinematics; Newton's laws, statics, dynamics; momentum and angular momentum; work, power, energy; relative motion: Coriolis force (*)</li> <li>gravitation: Kepler's laws, Newton's gravity law, potential energy, motion of satellites; tide, motion of space bodies (*);</li> <li>oscillations and waves;</li> <li>structure of matter; deformations; static fluids: pressure(*), pressure measurements, Buoyant forces;</li> <li>temperature: thermal expansion, ideal gas;</li> </ul> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| <ul style="list-style-type: none"> <li>• energijski zakon: notranja energija, toplota, prenos toplote, spremembe agregatnega stanja, vlažnost(*);</li> <li>• elektrostatika; električni tok: vezja, delo in moč; magnetizem; indukcija;</li> <li>• elektromagnetno valovanje; sevanje;</li> <li>• svetloba; svetlobni izvori: sonce, prehod svetlobe skozi ozračje, efekt tople grede, fotometrija(*);</li> <li>• geometrijska optika: odboj svetlobe, zrcala, lom svetlobe, leče(*), napake leč; optični instrumenti(*);</li> <li>• valovna optika: polarizacija, interferenca; fotonaska teorija svetlobe; posebna teorija relativnosti.</li> </ul> <p>Vsebine, označene z (*), bodo podrobneje obravnavane na seminarjih ali kot računski zgledi na seminarskih vajah.</p> | <ul style="list-style-type: none"> <li>• the first law of thermodynamics, internal energy, heat, heat transfer, phase changes, humidity (*);</li> <li>• electrostatics; electric current, circuits, work and power; magnetism; induction;</li> <li>• electromagnetic waves; radiation;</li> <li>• visible light; light sources: Sun, absorption of light in atmosphere, green house effect, photometry (*);</li> <li>• geometric optics: reflection and refraction of light, mirrors, lenses (*), optic instruments (*);</li> <li>• wave optics: polarization and interference of light; photons as quanta of light; special theory of relativity.</li> </ul> <p>Topics labelled with (*) will be discussed in more detail at seminars or as assigned exercises.</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

#### Temeljna literatura in viri/Readings:

Kladnik, R. Osnove fizike I. in II. del, 1979. Ljubljana, DZS.

Kladnik, R. Visokošolska fizika, deli I., II. in III. 1989. Ljubljana, DZS.

Kladnik, R., Šolinc, H. 1996. Zbirka fizikalnih nalog z rešitvami, I. in II. del. Ljubljana, DZS.

Serway, R.A. 1996. Physics for Scientists & Engineers with Modern Physics. Philadelphia. Saunders College Publ.

#### Cilji in kompetence:

- Spoznati osnovne fizikalne zakone in naravne pojave ter načine njihovega opisa
- Fizikalni način razmišljanja pri formulaciji in reševanju tehničnih problemov.
- Obvladovanje praktične in teoretične osnove fizike z dodatnim poudarkom na gravitaciji, gibanju nebesnih teles, elektromagnetnemu valovanju, svetlobi in optičnih inštrumentih. Le-to je še posebej pomembno za študij geodezije in za razumevanje geodetske stroke.

#### Objectives and competences:

- To learn basic laws of physics and natural phenomena and the ways to describe them
- To recognize, formulate and solve engineering problems using the methods of physics.
- To manage practical and theoretical basics of physics with focus on gravity, motion of space bodies, electromagnetic waves, light and optical instruments. These are necessary for study of geodesy and understanding of the geodesic profession.

#### Predvideni študijski rezultati:

- Poznavanje in razumevanje osnovnih znanj iz poglavij fizike, ki so opisana v vsebini predmeta.
- Študenti se bodo naučili uporabljati osnovne fizikalne zakonitosti pri računski obravnavi zgledov, ki so povezani s prakso v tehniki in geodeziji.

#### Intended learning outcomes:

- Solid knowledge and understanding of the topics listed in the content section.
- The students will learn to apply the methods of physics in order to address engineering and geodesic problems.
- The seminars and problem-solving classes are structured so as to teach the students how to

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Cilj dela pri vajah in seminarju je, da se študenti naučijo, kako določen zahteven fizikalno-tehniški problem smiselno poenostavijo in s preprostimi računskimi operacijami ocenijo velikost neznane količine.</li> <li>• S pridobljenim znanjem bodo študenti sposobni prepoznati fizikalno ozadje različnih naravnih pojavov, še posebej z znanjem o gravitaciji, gibanju nebesnih teles, elektromagnetnemu valovanju, svetlobi in optičnih inštrumentih. Tako bodo pridobili sposobnost kritične analize le teh, tako v širšem pogledu kot tudi pri pojavih bolj specifičnih za geodetsko stroko.</li> </ul> | <p>simplify complex problems and obtain an approximate solution.</p> <ul style="list-style-type: none"> <li>• With gained knowledge, students will be able to recognize the physical background of various natural phenomena, in particular the knowledge on gravity, movement of space bodies, electromagnetic waves, light and optical instruments . With this they will gain the ability to critically analyze phenomena in a broad sence, as well as more specifically within geodesic profession.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                                                   |                                                                                         |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| Predavanja in seminar z demonstracijskimi poskusi in računalniškimi simulacijami. | Lectures and seminars together with laboratory demonstrations and computer simulations. |
| Računski zgledi na seminarjih vajah.                                              | Problem solving classes.                                                                |
| Individualne naloge ali seminarji.                                                | Individual assignments or seminars                                                      |

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

|                                         |         |                                                   |
|-----------------------------------------|---------|---------------------------------------------------|
| Teoretični del (pisno in ustni zagovor) | 40,00 % | Written answers to selected theoretical questions |
| Projekt (seminarska naloga)             | 10,00 % | Written seminar report                            |
| Računski del (pisno)                    | 50,00 % | Written solution of assigned problems             |

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

J. Vucicevic, J. Kokalj, R. Zitko, N. Wentzell, D. Tanaskovic, and J. Mravlje, Conductivity in the Square Lattice Hubbard Model at High Temperatures: Importance of Vertex Corrections, Phys. Rev. Lett. 123, 036601 (2019), DOI:<https://doi.org/10.1103/PhysRevLett.123.036601>

Peter T. Brown, Debayan Mitra, Elmer Guardado-Sanchez, Reza Nourafkan, Alexis Reymbaut, Charles-David Hebert, Simon Bergeron, A.-M. S. Tremblay, Jure Kokalj, David A. Huse, Peter Schauss, Waseem S. Bakr, Bad metallic transport in a cold atom Fermi-Hubbard system, Science 363, 379 (2019), DOI: [10.1126/science.aat4134](https://doi.org/10.1126/science.aat4134)

J. Kokalj, Bad-metallic behavior of doped Mott insulators, Phys. Rev. B 95, 041110(R) (2017), DOI:<https://doi.org/10.1103/PhysRevB.95.041110>

J. Kokalj and Ross H. McKenzie, *Enhancement of thermal expansion of organic charge-transfer salts by strong electronic correlations*, Phys. Rev. B 91, 205121 (2015), DOI:<https://doi.org/10.1103/PhysRevB.91.205121>

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                         |
|----------------------|-----------------------------------------|
| <b>Predmet:</b>      |                                         |
|                      | <b>PROGRAMSKA ORODJA V GEODEZIJI</b>    |
| <b>Course title:</b> |                                         |
|                      | <b>SOFTWARE IN GEODETIC ENGINEERING</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 1. letnik | Zimski   |

Univerzitetna koda predmeta/University course code:

1030

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

Nosilec predmeta/Lecturer:

Krištof Oštir

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:

|  |  |
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|  |  |
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Vsebina:

Content (Syllabus outline):

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Uvod (vloga in pomen informacij, inženirska informacija, reševanje inženirskih problemov z računalniki, informacijski sistemi, informacijska onesnaženost in informacijska pismenost),</li> <li>komunikacija in komunikacijska tehnologija (komuniciranje in pomen, oblike, računalniška omrežja, naprave v omrežjih, internet),</li> <li>računalniška programska oprema (operacijski sistemi, namizne in oblačne aplikacije, porazdeljena obdelava podatkov),</li> <li>reševanje inženirskih problemov z računalniki (analiza in modeliranje problemov, podatkovne</li> </ul> | <ul style="list-style-type: none"> <li>Introduction – the role and importance of information, engineering information, solving engineering problems with computers, information systems, information pollution and information literacy,</li> <li>communication and communications technology – importance of communication, forms, computer networks, and devices on networks, Internet,</li> <li>computer software – operating systems, desktop and cloud applications, distributed data processing,</li> </ul> |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>strukture, izdelava in zapis algoritmov, standardni algoritmi),</p> <ul style="list-style-type: none"> <li>spoznavanje izbrane namenske programske opreme (QGIS, ArcGIS, AutoCAD, Word, Excel, Powerpoint, ...).</li> </ul> <p><b>Vaje:</b></p> <ul style="list-style-type: none"> <li>spoznavanje programov QGIS, ArcGIS, AutoCAD, Excel, ... Osnovne funkcije, analiza geodetskih podatkov,</li> <li>Python kot programski jezik - razvojno okolje, razvoj programov in</li> <li>primeri avtomatizacija dela s Pythonom, primer QGIS, PostgreSQL+PostGIS.</li> </ul> | <ul style="list-style-type: none"> <li>solving engineering problems with computers – analysis and modelling problems, data structures, creating and using algorithms, standard algorithms.</li> <li>getting to know dedicated computer software (QGIS, ArcGIS, AutoCAD, Word, Excel, PowerPoint, ...)</li> </ul> <p><b>Exercises:</b></p> <ul style="list-style-type: none"> <li>getting to know the programs QGIS, ArcGIS, AutoCAD, Excel, ... – basic functions, the analysis of geodetic data,</li> <li>Python as the programming language – development environment, program development and</li> <li>examples of automation of work with Python, examples in QGIS, PostgreSQL and PostGIS.</li> </ul> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Temeljna literatura in viri/Readings:**

Prosojnice predavanj, navodila za vaje

LONGLEY, Paul A., Michael F. GOODCHILD, David J. MAGUIRE, and David W. RHIND. 2015. Geographic Information Science and Systems. New Jersey: Wiley.

GRASER, Anita. Learning QGIS. Birmingham: Packt Publishing, 2014.

**Cilji in kompetence:**

- Pridobiti izbrana računalniška znanja, veščine obvladovanja in povezovanja najrazličnejših računalniških orodij,
- usvojiti osnovna znanja in veščine tehničnega računanja in programiranja, ki so nujno potrebne reševanje problemov geodezije in geoinformatike,
- usposobiti se za uporabo različnih vrst računalniških orodij (elektronska preglednica, orodje za tehnično računanje, program za grafično predstavitev, sistem za upravljanje z bazo podatkov, program za tehnično risanje, GIS ...) za reševanje različnih, sestavljenih problemov v geodeziji in geoinformatiki.

**Objectives and competences:**

- Acquire selected computer skills, computer management skills and use of wide range of software tools,
- master the basic skills of technical computing and programming that are necessary for problem solving in geodesy and geoinformatics,
- trained to use various kinds of computer tools (electronic spreadsheet, technical computing tool, a program for graphical presentation, system for database management, technical drawing software, GIS ...) to tackle various problems in geodesy and geoinformatics.

**Predvideni študijski rezultati:**

- Študent je sposoben izkazati znanje in razumevanje konceptov systemske in uporabniške programske opreme v inženirstvu.
- Študent je sposoben izbrati in uporabiti primerno uporabniško programsko opremo za izbrano nalogo s področja geodezije.
- Študent je sposoben učinkovito uporabljati izbrano programsko opremo za reševanje inženirskih problemov s področja geodezije.

**Intended learning outcomes:**

- Student is able to demonstrate knowledge and understanding of system and application software concepts in engineering.
- Student is able to select appropriate application software for selected task in a field of geodesy.
- Student is able to efficiently use selected software for solving engineering problems in geodesy.
- Student understands and is capable of designing simple algorithms and implementing them in a computer programme.

- Študent razume in zna zasnovati preproste algoritme ter izdelati ustrezen računalniški program.

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

Uvod v seminar z uporabo sodobnih učnih pripomočkov, seminarsko delo v računalniški učilnici (v okviru seminarskega dela dobijo študenti možnost aktivne vključitve v predstavitev dogovorjenih vsebin), vaje v računalniški učilnici.

Introductory lectures with the use of modern teaching aids, course work in computer lab (in seminar work students are actively involved in the presentation of some contents), exercises in the computer lab.

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

|                                   |         |                                                                         |
|-----------------------------------|---------|-------------------------------------------------------------------------|
| Naloge in sprotno delo            | 40,00 % | Exercise (requirements which has to be fulfilled before the final exam) |
| Seminarska naloga                 | 40,00 % | Seminar work                                                            |
| Izpit (zagovor seminarske naloge) | 20,00 % | Final exam (seminar work defence)                                       |

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

MARSETIČ, Aleš, OŠTIR, Krištof, KOSMATIN FRAS, Mojca. Automatic orthorectification of high-resolution optical satellite images using vector roads. IEEE transactions on geoscience and remote sensing, ISSN 0196-2892. [Print ed.], 2015, vol. 53, iss. 11, str. 6035-6047, doi: 10.1109/TGRS.2015.2431434.

ĐURIĆ, Nataša, PEHANI, Peter, OŠTIR, Krištof. Application of in-segment multiple sampling in object-based classification. Remote sensing, ISSN 2072-4292. [Online ed.], Dec. 2014, vol. 6, iss. 12, str. 12138-12165.

MARSETIČ, Aleš, OŠTIR, Krištof, ZAKŠEK, Klemen, OŠTIR, Krištof. Downscaling land surface temperature for urban heat island diurnal cycle analysis. Remote sensing of environment, ISSN 0034-4257. [Print ed.], 2012, vol. 117, str. 114-124, ilustr., doi:10.1016/j.rse.2011.05.027. ZAKŠEK, Klemen, OŠTIR, Krištof, KOKALJ, Žiga. Sky-view factor as a relief visualization technique. Remote sensing, ISSN 2072-4292. [Online ed.], 2011, 3, 2, str. 398-415.

PEHANI, Peter, ČOTAR, Klemen, MARSETIČ, Aleš, ZALETELJ, Janez, OŠTIR, Krištof. Automatic geometric processing for very high resolution optical satellite data based on vector roads and orthophotos. Remote sensing, ISSN 2072-4292. [Online ed.], 2016, vol. 8, iss. 4.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                             |
|----------------------|---------------------------------------------|
| <b>Predmet:</b>      |                                             |
|                      | <b>UVOD V GEODEZIJO</b>                     |
| <b>Course title:</b> |                                             |
|                      | <b>INTRODUCTION TO GEODETIC ENGINEERING</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 1. letnik | Zimski   |

Univerzitetna koda predmeta/University course code:

1796

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

Nosilec predmeta/Lecturer:

Simona Savšek

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:

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Vsebina:

Content (Syllabus outline):

- Definicije geodezije, organiziranost stroke in kompetence geodeta,
- razdelitev geodezije (področja, dejavnosti, naloge, povezava z drugimi vedami),
- mednarodna organiziranost geodezije,
- zgodovina geodezije, razvoj geodezije,
- geodezija kot stroka, ki zagotavlja družbeno prostorsko infrastrukturo - geodezija s stališča uporabnika,
- geodetske meritve: uvod v mersko in instrumentalno tehniko, merske enote, merski sistem, merski postopek;

- Definition of geodetic engineering and surveyor,
- different branches of geodetic engineering, tasks, relation to other professions,
- International organization of geodetic engineering,
- history, technical development,
- geodetic engineering as a profession, which assures national spatial infrastructure, geodetic engineering from the aspect of users,
- surveying measurements: introduction of surveying measurement equipment, units and

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• pogreški pri merjenju (vzroki in vrste); občutljivost merskega sistema. Osnovi pojmi kot so preizkus in kalibracija merske opreme, justiranje, umerjanje, ločljivost, občutljivost, preciznost, natančnost, zanesljivost, ponovljivost.,</li> <li>• merska strategija (merski in računski prostor, geodetska merska tehnika),</li> <li>• verjetnost (Gaussova krivulja) in pomen nadštevilnih meritev</li> <li>• vrste geodetskih točk in geodetskih mrež.,</li> <li>• načini stabilizacije merskih točk,</li> <li>• občutljivost, preizkus in rektifikacija libel,</li> <li>• pomožni merski pribor (stativ, reflektor, grezilo...),</li> <li>• delovanje teodolita, konstrukcijski pogoji, instrumentalni pogreški,</li> <li>• postavitve instrumenta (centriranje in horizontiranje),</li> <li>• merjenje Hz kotov (girusna metoda, viziranje), merjenje zenitnih razdalj,</li> <li>• osnove trigonometričnega višinomerstva in zagotovitev merskih pogojev.</li> </ul> | <p>procedures; observation errors (causes and types); sensitivity of the measurement system,</p> <ul style="list-style-type: none"> <li>• basic concepts as testing and calibration of surveying equipment, resolution, sensitivity, precision, accuracy, reliability, repeatability,</li> <li>• measurement strategy (measuring and computing space, geodetic measuring technique),</li> <li>• probability (Gauss distribution function); importance of redundant measurements. Types of geodetic points and geodetic networks,</li> <li>• methods of stabilization of measuring points. Sensitivity, testing and rectification of levels. Measurement accessories (tripod, reflector, plummet...),</li> <li>• operation of theodolites, construction conditions, instrumental errors,</li> <li>• layout of the instrument (centering, leveling),</li> <li>• basics of angle measurements (set of angles), zenith distances measurement,</li> <li>• basic of trigonometric leveling. and</li> <li>• suitable measuring conditions.</li> </ul> |
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**Temeljna literatura in viri/Readings:**

Kogoj, D., Stopar, B. 2006. Geodetska izmera. Gradivo za strokovni izpit iz geodetske stroke, Ljubljana, Inženirska zbornica Slovenije, Matična sekcija geodetov.

Dostopno na: [http://www.e-prostor.gov.si/fileadmin/ogs/GEODETSKA\\_IZMERA.pdf](http://www.e-prostor.gov.si/fileadmin/ogs/GEODETSKA_IZMERA.pdf)

Kahmen, H., Faig, W. 1988. Surveying, Berlin, New York, Walter de Gruyter.

Učno gradivo v spletni učilnici UL FGG.

Savšek, S. Uvod v geodezijo, prosojnice s predavanj in izbrana poglavja.

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

- Študent spozna pomen geodezije kot stroke ter področja geodezije, ki so prepoznavna tudi v drugih geoznanostih.
- Spozna pomen zajemanja prostorskih podatkov z vidika uporabnika ter uporabnost različnih načinov zajema.
- Študent spozna razvoj stroke, merskih postopkov in opreme v kronološkem smislu ter največje dosežke v geodeziji, poleg tega pa se seznani z nekaterimi novimi tehnikami in tehnologijami.
- Spozna delovanje teodolita in konstrukcijske pogoje
- Zna izvesti meritve s teodolitom in izračunati položaj točk v ravnini.

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

- Students become acquainted with the significance of surveying profession and geodetic engineering branches, recognized in other geosciences.
- Students recognize the global significance of spatial data and through description of space geometry with the use of coordinate systems.
- They are introduced to development of the surveying profession, measuring techniques in historical sense.
- Student is acquainted with the performance of the theodolite and its construction conditions.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <p><b>Kompetence:</b></p> <ul style="list-style-type: none"> <li>• prepozna in razume, katere prostorske podatke uporabniku zagotavljajo posamezna področja geodezije,</li> <li>• razume vzroke in vplive pogreškov pri meritvah,</li> <li>• spozna pomen in vrste geodetskih točk in geodetskih mrež,</li> <li>• zna zagotoviti merske pogoje in uporabiti osnovno mersko opremo za kotne meritve in spozna osnove trigonometričnega višinomertva.</li> </ul> | <ul style="list-style-type: none"> <li>• Is capable of performing angle measurements with theodolite and now how to determine 2D station coordinates.</li> </ul> <p><b>Competences:</b></p> <ul style="list-style-type: none"> <li>• understand and recognize what kind of spatial data is acquired by particular fields of Geodetic Engineering,</li> <li>• understand sources of and influences of measurements errors,</li> <li>• is acquainted with types of surveying benchmarks and geodetic networks,</li> <li>• is capable of assuring measuring conditions and know how to use basic surveying equipment for performing angle measurements and</li> <li>• is acquainted with basic of trigonometric levelling.</li> </ul> |
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**Predvideni študijski rezultati:**

- Študent spozna področja geodezije in naloge geodezije za zagotavljanje geoinformacijske infrastrukture v državi.
- Spozna pomen prostorskih podatkov ter načine zajemanja Študent pridobi temeljno znanje o merski in instrumentalni tehniki, pogreških pri merjenju ter osnovnih postopkih za zagotovitev pogojev za meritve.
- Samostojno izvede osnovne meritve s teodolitom in izračune položaja točk v ravnini.

**Intended learning outcomes:**

- Students are acquainted with all fields of geodetic engineering and its tasks.
- They are familiar with the influence of technological development on geodetic engineering and the latest technological achievements of the profession.
- They understand the importance of spatial data and its acquisition and maintenance.
- They understand the space geometry through the use of various coordinate systems.
- Students accept usable knowledge about measuring techniques, measuring errors and basic procedures for assuring suitable measuring conditions.
- Capable of performing basic angle measurements.

**Metode poučevanja in učenja:**

Predavanja potekajo v obliki ex-katedra z uporabo sodobnih učnih pripomočkov, grafičnih prikazov, demonstracij in primerov iz prakse. Praktične vaje potekajo v laboratorijski obliki ter v obliki praktičnih vaj na terenu in v računalniški učilnici.

**Learning and teaching methods:**

Lectures are ex-cathedra using different teaching aids as for example graphics, demonstrations and practical examples. Exercises are in the form of seminars, field work and computer classroom learning.

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

|                                                                    |         |                                                |
|--------------------------------------------------------------------|---------|------------------------------------------------|
| Domače naloge in sprotno delo (seminarske in laboratorijske vaje). | 40,00 % | Homework in everyday progress (exercises).     |
| Pisni izpit (teoretičen in računski del)                           | 60,00 % | Written exam (theoretical and practical part). |

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

SAVŠEK, Simona, AMBROŽIČ, Tomaž, KOGOJ, Dušan. Terestrična izmera mikromreže pri vzpostavitvi mareografske postaje Koper = Terrestrial measurements of mikro network for the establishment of the tide gauge station Koper. Geod. vestn. [Tiskana izd.], 2007, letn. 51, št. 1, str. 48-58.

SAVŠEK, Simona, AMBROŽIČ, Tomaž, KOGOJ, Dušan, KOLER, Božo, STERLE, Oskar, STOPAR, Bojan. Geodezija v geotehniki = Geodesy in geotechnics. Geod. vestn. [Tiskana izd.], 2010, letn. 54, št. 1, str. 31-45, ilustr.

SAVŠEK, Simona, AMBROŽIČ, Tomaž, STOPAR, Bojan, TURK, Goran. Determination of Point Displacements in the Geodetic Network. J. surv. eng., 2006, letn. 132, št. 2, str. 58-63.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                              |
|----------------------|------------------------------|
| <b>Predmet:</b>      |                              |
|                      | <b>GEODETSKI RAČUNI</b>      |
| <b>Course title:</b> |                              |
|                      | <b>GEODETIC COMPUTATIONS</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 1. letnik | Zimski   |

Univerzitetna koda predmeta/University course code:

1796

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

Nosilec predmeta/Lecturer:

Miran Kuhar

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:

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Vsebina:

Content (Syllabus outline):

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Števila kot rezultat merjenja in računanja, pomembne cifre, napake pri numeričnem računanju.</li> <li>Kot, definicija, kotna in ločna mera kota.</li> <li>Trigonometrija v ravnini.</li> <li>Pravokotni in krivočrtni koordinatni sistemi.</li> <li>Vrste koordinat v ravnini, pretvorba koordinat.</li> <li>Merski in računski prostor.</li> <li>Postopki izračuna koordinat v ravnini (poligon, izračun koordinat točk na liniji in pravokotnici, ločni presek, zunanji urez, notranji urez).</li> <li>Zemlja in aproksimacije oblike Zemlje.</li> <li>Sferna trigonometrija.</li> </ul> | <ul style="list-style-type: none"> <li>Principles of calculation, numbers as outcomes of measurements, significant figures, the accuracy of calculations.</li> <li>Angle, definition, angular units, degree, grad, radian.</li> <li>Plane trigonometry.</li> <li>Rectangular and curvilinear coordinate systems.</li> <li>Coordinate systems in the plane, coordinate conversions.</li> <li>Point positioning in 2D: traverses, coordinates on the line and the rectangle line, intersection, resection, trilateration.</li> <li>The figure of the Earth and its approximations.</li> </ul> |
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|                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Uporaba sferne geodezije za reševanje problemov v geodeziji in navigaciji, navtični sferni trikotnik, pojem ortodrome in loksodrome.</li> <li>• Geografske koordinate na Zemlji krogli.</li> <li>• Prva in druga geodetska naloga na Zemlji krogli.</li> </ul> | <ul style="list-style-type: none"> <li>• Spherical trigonometry,</li> <li>• Spherical trigonometry used in Surveying, Navigation, nautical spherical triangle, great circle, and rhumb-line.</li> <li>• Geographical coordinates on the spherical Earth.</li> <li>• The direct and inverse geodetic problems on the sphere.</li> </ul> |
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**Temeljna literatura in viri/Readings:**

Ghilani C.D., Wolf P. 2015. Elementary Surveying: An Introduction to Geomatics, Pearson Education Limited, Harlow, UK.

Harvey B. 2017. Survey Computations, School of Surveying and Spatial Information Systems The University of New South Wales, Avstralija. ([https://www.engineering.unsw.edu.au/civil-engineering/sites/civil/files/uploads/PDF/BRH\\_Survey\\_Comps%20textbook.pdf](https://www.engineering.unsw.edu.au/civil-engineering/sites/civil/files/uploads/PDF/BRH_Survey_Comps%20textbook.pdf))

Kuhar, M. Geodetski računi, skripta 2018 (dostopno v spletni učilnici)

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

- Zna izračunati položaj točk v ravnini na osnovi različnih meritev.
- Pozna različne postopke reševanja sfernih trikotnikov.
- Spozna geodetske koordinate na krogli in postopke pretvorbe geodetskih koordinat v kartezične.
- Zna vzpostaviti povezavo med navtičnim trikotnikom in osnovnimi navigacijskimi nalogami na Zemlji-krogli.
- Rešuje enostavne probleme izračuna na ortodromi in loksodromi.

**Kompetence:**

- prepozna in razume, katere vrste meritev potrebujemo za določitev koordinat v ravnini,
- povezuje naloge določitve položaja v ravnini z določitvijo višin,
- razume pomen geografskih koordinat na Zemlji,
- prepozna razliko med različnimi osnovnimi navigacijskimi nalogi na Zemlji kot krogli,
- razume praktično razliko potovanja po ortodromi in loksodromi

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

- Students become acquainted with the methods of point positioning in the plane based on different measurements.
- Students recognize different procedures for solving spherical triangles.
- they are introduced to geodetic coordinates on the sphere and their transformation into 3D cartesian coordinates,
- Students become capable to establish the connection between the nautical triangle and basic problems of navigation,
- is capable to solve various basic problems on the great circle and rhumb-line.

**Competencies:**

- to understand and recognize what kind of measurements are acquired for the specific procedures of point positioning,
- is capable to establish the connection between horizontal coordinates, measurements, and computation of heights,
- to understand the importance of geographic coordinates on Earth,
- to understand the difference between basic navigation problems on the sphere Earth,
- to understand the difference between great circle and rhumb-line.

**Predvideni študijski rezultati:**

- Študent spozna osnovne postopke izračuna koordinat v ravnini.
- Študent spozna osnovne postopke sferne trigonometrije.
- Zna izračunati geodetski nalogi na Zemlji-krogli.
- Zna razlikovati med gibanjem po ortodromi in loksodromi in na osnovi tega oceniti razliko v dolžini krivulj.
- Spozna navigacijske naloge na Zemlji-krogli.

**Intended learning outcomes:**

- They understand space geometry through the use of various coordinate systems.
- Students know how to use various methods of point positioning in the plane.
- Know how to solve forward and inverse problem on the Earth - sphere.
- The student is acquainted with the navigational problems on the spherical Earth.

**Metode poučevanja in učenja:**

Predavanja potekajo v obliki ex-katedra z uporabo sodobnih učnih pripomočkov, grafičnih prikazov, demonstracij in primerov iz prakse. Praktične vaje potekajo v laboratorijski obliki ter v obliki praktičnih vaj na terenu in v računalniški učilnici.

**Learning and teaching methods:**

Lectures are ex-cathedra using different teaching aids as for example graphics, demonstrations and practical examples. Exercises are in the form of seminars, field work and computer classroom learning.

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

|                                                                    |         |                                                |
|--------------------------------------------------------------------|---------|------------------------------------------------|
| Domače naloge in sprotno delo (seminarske in laboratorijske vaje). | 50,00 % | Homework in everyday progress (exercises).     |
| Pisni izpit (teoretičen in računski del).                          | 50,00 % | Written exam (theoretical and practical part). |

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

DELČEV S., GUČEVIĆ J., OGRIZOVIĆ V., KUHAR M. First-order trigonometric network in the former Yugoslavia. *Acta geodaetica et geophysica*, ISSN 2213-5812, jun. 2015, letn. 50, št. 2, str. 219-241, ilustr., doi: 10.1007/s40328-014-0093-1. [COBISS.SI-ID 6914401],

KUHAR, M. Pot do novega modela geoida v Sloveniji. *Geodetski Vestnik*, ISSN 0351-0271. [Tiskana izd.], 2017, letn. 61, št. 2, str. 187-200, ilustr. [http://geodetski-vestnik.com/61/2/gv61-2\\_kuhar.pdf](http://geodetski-vestnik.com/61/2/gv61-2_kuhar.pdf), doi: [10.15292/geodetski-vestnik.2017.02.187-200](https://doi.org/10.15292/geodetski-vestnik.2017.02.187-200). [COBISS.SI-ID 8101985]

PAVLOVČIČ PREŠEREN, P., PETRIN T., KOLER B., URBANČIČ T., KUHAR M. Različni postopki za izračun odklonov navpičnice : primer območja pod Krvavcem = Different aspects of the computation of vertical deflection : case study in the area of Krvavec. *Geodetski vestnik : glasilo Zveze geodetov Slovenije*, ISSN 0351-0271. [Tiskana izd.], 2018, letn. 62, št. 1, str. 13-27, ilustr. [http://www.geodetski-vestnik.com/62/1/gv62-1\\_preseren.pdf](http://www.geodetski-vestnik.com/62/1/gv62-1_preseren.pdf), doi: [10.15292/geodetski-vestnik.2018.01.13-27](https://doi.org/10.15292/geodetski-vestnik.2018.01.13-27). [COBISS.SI-ID 8392545]

REPANIĆ M., KUHAR M. Modelling hysteresis effect in Scintrex CG-3M gravity readings. *Geophysical prospecting*, ISSN 1365-2478, jan. 2018, letn. 66, št. 1, str. 257-269, ilustr. <http://onlinelibrary.wiley.com/doi/10.1111/gpr.2018.66.issue-1/issuetoc>, doi: [10.1111/1365-2478.12557](https://doi.org/10.1111/1365-2478.12557). [COBISS.SI-ID 8257633]

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

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

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 1. letnik | Letni    |

Univerzitetna koda predmeta/University course code:

1583

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

Nosilec predmeta/Lecturer:

Marjeta Kramar Fijavž, Ganna Kudryavtseva

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:

Opravljen izpit iz Matematike I oz. drugega predmeta s primerljivo vsebino.

Passed exam in Mathematics I or other courses with comparable content.

Vsebina:

Content (Syllabus outline):

- Skalarne funkcije več realnih spremenljivk: metrika prostora  $R^n$ , definicijsko območje, graf, nivojnice, limita in zveznost funkcije več realnih spremenljivk, odvod v dani smeri, parcialni odvodi, gradient, stacionarne točke, vezani ekstremi, globalni ekstremi, višji parcialni odvodi, Taylorjeva formula, Jacobijeva matrika za vektorsko funkcijo vektorskega argumenta, verižno pravilo.
- Dvojni in trojni integral: Riemannova integralska vsota, integrabilnost, lastnosti, prevedba dvojnega (trojnega) integrala na dvakratni

- Scalar functions of several real variables: metrics of the space  $R^n$ , domain, graph, isohipses, limit and continuity of a multivariate real function, directional derivative, partial derivative, gradient, stationary points, constrained extrema, global extrema, higher partial derivatives, Taylor formula, Jacobi matrix for vector function of a vector argument, chain rule.
- Double and triple integral: Riemannian sum, integrability, properties, transformation of double (triple) integral to twice (three times)

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>(trikratni) integral, uvedba novih spremenljivk (polarne, cilindrske, sferne koordinate).</p> <ul style="list-style-type: none"> <li>• Integrali s parametrom: integriranje, odvajanje, funkciji gama in beta.</li> <li>• Diferencialna geometrija: pot, krivulja, parametrizacija, dolžina krivulje, naravni parameter, osnovni trieder, fleksija, torzija, krivinski polmer, Frenet-Serrejeve formule, gladka elementarna ploskev, parametrizacija, tangentna ravnina, površina.</li> <li>• Krivuljni integral: krivuljni integral 1. vrste skalarne polja po krivulji, orientacija krivulje, krivuljni integral 2. vrste vektorskega polja po orientirani krivulji, Greenova formula.</li> <li>• Ploskovni integral: ploskovni integral 1. vrste skalarne polja po ploskvi, orientacija ploskve, ploskovni integrala 2. vrste vektorskega polja po orientirani ploskvi.</li> <li>• Integralski izreki: diferencialni operatorji: grad, div, rot, Gaussov in Stokesov izrek, gradientnost (potencialnost, konzervativnost) vektorskega polja.</li> <li>• Navadne diferencialne enačbe: rešitev, DE prvega reda (ločljive spremenljivke, homogena, linearna), začetni problem, linearna DE n-tega reda s konstantnimi koeficienti.</li> </ul> | <p>univariate integral, substitution (polar, cylindric, spheric coordinates).</p> <ul style="list-style-type: none"> <li>• Integrals with parameter: integration, derivation, functions gamma and beta.</li> <li>• Differential geometry: path, curve, parameterization, curve length, natural parameter, basic trihedron, inflection, torsion, curvature radius, Frenet-Serre formulae, smooth elementary surface, parameterization, tangent plane, area.</li> <li>• Line integral: line integral of a scalar field along a curve, curve orientation, line integral of a vector field along an oriented curve, Green formula.</li> <li>• Surface integral: surface integral of a scalar field on a surface, surface orientation, surface integral of order 2. of a vector field on an oriented surface.</li> <li>• Integral theorems: differential operators: grad, div, rot, theorems of Gauss and Stokes, gradient (potential, conservative) vector fields.</li> <li>• Ordinary differential equations: solution, ODE of first order (separate variables, homogenous, linear), initial problem, linear ODE of order n with constant coefficients.</li> </ul> |
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#### Temeljna literatura in viri/Readings:

FOERSTER G. O. 1984. Analysis 2, 3 Vieweg Studium.

LIPSCHUTZ, M. 1969. Differential Geometry, Schaum's outline series. McGraw-Hill Book Company.

MIZORI\_OBLAK, P. 1987. Matematika za študente tehnike in naravoslovja II, III. Ljubljana, UL FS.

THOMAS B., WEIR M. D. 1996. Calculus and Analytic Geometry, 9th ed. Addison-Wesley.

VIDAV. 1975. Višja matematika II, III. Ljubljana, DMFA Slovenije.

ZORICH, V. A.. 2004. Mathematical Analysis I, II. Springer Verlag, Universitext.

#### Cilji in kompetence:

##### Cilji:

- omogočiti razumevanje matematičnega aparata, ki ga uporabljajo strokovni predmeti,
- usposobiti za kritično presojo podatkov in dobljenih računskih rezultatov.

##### Pridobljene kompetence:

- sposobnost abstraktne formulacije konkretnih problemov,
- zna uporabiti matematiko pri inženirskih problemih,
- razvijanje matematičnega mišljenja - sklepanje od splošnega k posebnemu in obratno.

#### Objectives and competences:

##### Objectives:

- to enable understanding of mathematical tools used by engineering courses,
- to train for critical judgement of data and obtained numerical results.

##### Gained competences:

- to be able to formulate practical problems abstractly,
- to be able to use mathematics in engineering problems,
- to develop of mathematical thinking - reasoning from general to special and vice versa.

**Predvideni študijski rezultati:**

- Imeti osnovna znanja iz matematične analize,
- diferencialne geometrije in vektorske analize,
- imeti osnovne računske spretnosti,
- doseženo matematično znanje uporabljajo strokovni predmeti in omogoča nadaljevanje poglobljenega študija tiste matematike, ki jo uporablja tehnika,
- matematika se izkaže kot uporabna, celo kot nujna osnovna znanost pri študiju tehnike,
- spoznanje, da je matematika prisotna v vseh porah človekovega delovanja,
- sposobnost abstraktne formulacije konkretnih problemov,
- sposobnost kritične presoje podatkov in dobljenih računskih rezultatov
- sposobnost sklepanja od splošnega k posebnemu in obratno in
- spretnost uporabe literature.

**Intended learning outcomes:**

- To possess basic knowledge in mathematical analysis, differential geometry and vector analysis,
- to handle basic computational skills,
- the achieved mathematical knowledge is used by the engineering courses and enables the study of mathematics for technology,
- mathematical science is essential in the study of technology,
- mathematics is present in all pores of human activity,
- ability of abstract formulation of practical problems,
- capability of critical judgement of data and obtained numerical results,
- ability of reasoning from general to special and vice versa and
- ability to use relevant literature.

**Metode poučevanja in učenja:**

Predavanja, seminarske vaje, konzultacije, internet.

**Learning and teaching methods:**

Lectures, tutorials, consultations, internet.

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

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

KRAMAR FIJAVŽ, Marjeta, LAKNER, Mitja, ŠKAPIN-RUGELJ, Marjeta. An equal-area method for scalar conservation laws. The Anziam journal, 2012, vol. 53, iss. 2, str. 156-170. <http://dx.doi.org/10.1017/S1446181112000065>.

SKUBIC, Blaž, LAKNER, Mitja, PLAZL, Igor. Sintering behavior of expanded perlite thermal insulation board: modeling and experiments. Ind. eng. chem. res. [Print ed.], 9. jul. 2013, vol. 52, no. 30, str. 10244-10249, ilustr. <http://pubs.acs.org/doi/ipdf/10.1021/ie400196z>, doi: 10.1021/ie400196z.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                             |
|----------------------|---------------------------------------------|
| <b>Predmet:</b>      |                                             |
|                      | <b>GRADBENIŠTVO IN INFRASTRUKTURA</b>       |
| <b>Course title:</b> |                                             |
|                      | <b>CIVIL ENGINEERING AND INFRASTRUCTURE</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 1. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1033 |
|------------------------------------------------------------|------|

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

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

|                                    |                                            |
|------------------------------------|--------------------------------------------|
| <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>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Predavanja:</b> <ul style="list-style-type: none"> <li>standardna klasifikacija dejavnosti in gradbenih objektov,</li> <li>gradbena dokumentacija,</li> <li>geomehanske podlage, zemeljska dela in temeljenje,</li> <li>bistveni konstrukcijski elementi,</li> <li>značilnosti projektiranja in izgradnje visokih in nizkih gradenj,</li> <li>osnovni materiali, gradiva in veziva,</li> <li>gradbena pogodba, gradbene uzance in projektno vodenje,</li> </ul> | <b>Lectures:</b> <ul style="list-style-type: none"> <li>civil engineering, building structures, standard classification of activities in civil engineering and structures,</li> <li>building documentation.</li> <li>geomechanical bases, earth works and foundation engineering, structural elements,</li> <li>design and construction of buildings and roads and railways,</li> <li>infrastructural buildings and devices,</li> <li>basic materials, building materials and binders, structural solutions,</li> <li>construction contract, project management,</li> </ul> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• pravne podlage za izvajanje geodetske dejavnosti,</li> <li>• vloga geodeta pri izgradnji objektov in vzpostavitvi zbirnega katastra gospodarske javne infrastrukture in</li> <li>• zbirni kataster gospodarske javne infrastrukture.</li> </ul> <p><b>Vaje:</b></p> <ul style="list-style-type: none"> <li>• topografski prikaz gospodarske javne infrastrukture (GJI),</li> <li>• uporaba šifranta GJI, pregled in iskanje GJI na spletnih portalih,</li> <li>• vloga geodezije pri GJI (projektiranje, izvedba in vpis v uradne evidence),</li> <li>• izdelava projektnega poročila za enostavni objekt (opis delovanja in elementov, tipični prerezi, potrebni material za izvedbo)</li> </ul> | <ul style="list-style-type: none"> <li>• legal bases of activities in geodesy,</li> <li>• cadastre of public infrastructure facilities.</li> </ul> <p><b>Tutorials:</b></p> <ul style="list-style-type: none"> <li>• topographic map of public infrastructure, the use of public infrastructure code register,</li> <li>• searching and checking for public infrastructure data on web portals,</li> <li>• elaborating a project report of a simple construction</li> <li>• (description of operation and construction elements, typical cross-sections, implemented materials).</li> </ul> |
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### Temeljna literatura in viri/Readings:

Gradbeniški priročnik 2012: Peta, dopolnjena izdaja, Tehniška založba Slovenije, Ljubljana.

Koler, B., Lipar, P., Steinman, F., Kozelj, D., Šantl, S. 2010: Gradbeništvo in infrastruktura, skripta, Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo: 173 str.

Seliškar, N. 1997: Stavbarstvo, 3. ponatis, Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo: 381 str.

Steinman, F., Gosar, L. 2004: Osnove gradbeništva, skripta, Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo: 120 str.

Uredba o uvedbi in uporabi enotne klasifikacije vrst objektov in o določitvi objektov državnega pomena. Uradni list RS št. 33/2003: 3668-3873.

Zakon o geodetski dejavnosti. Uradni list RS št. 77/2010: 11281-11290.

Učno gradivo v spletni učilnici.

### Cilji in kompetence:

#### Cilji:

- študenti se seznaniijo z osnovnimi pojmi s področja gradbeništva, ki so kakorkoli povezani z geodezijo, s poudarkom na povezavi geodet – gradbenik,
- seznaniijo se s tehnično tehnološkimi značilnostmi enostavnih in zahtevnih objektov in napravami gospodarske javne infrastrukture in organiziranostjo in vodenjem zbirnega katastra gospodarske javne infrastrukture in
- seznaniijo se tudi s pravnimi podlagami za izvajanje geodetske dejavnosti, organiziranostjo geodetske službe in vlogo geodeta pri vzpostavitvi zbirnega katastra gospodarske javne infrastrukture.

#### Kompetence:

### Objectives and competences:

#### Objectives:

- students became acquainted with the basic concept, tasks of civil engineering, building structures and legal bases,
- they know how important cooperation with construction engineer on building site is. They are introduced to technical - technological characteristics of civil engineering structures and infrastructure facilities and
- they are introduced to legal bases of land survey. They know how important geodetic engineer is for cadastre of public infrastructure facilities.

#### Competences:

- recognize basic concept and tasks of civil engineering,

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• spoznavanje temeljnih vsebin in pojmov povezanih z gradbeništvo in izgradnjo objektov,</li> <li>• spoznavanje tehnoloških značilnosti objektov in naprav gospodarske javne infrastrukture,</li> <li>• spoznati pravne podlage za izvajanje geodetske dejavnosti,</li> <li>• spoznati zgodovinski razvoj zbirnih katastrov komunalnih naprav,</li> <li>• spoznati vlogo geodezije pri vzpostavitvi zbirnega katastra gospodarske javne infrastrukture in</li> <li>• navajati študente na samostojno delo.</li> </ul> | <ul style="list-style-type: none"> <li>• recognize to technical-technological characteristics of civil engineering structures and infrastructure facilities,</li> <li>• recognize the legal basis of land surveying,</li> <li>• recognize the historical development of cadastre of public technical infrastructure and</li> <li>• recognize the role of geodesy in the development of cadastre of public infrastructure facilities.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Seznanitev s strokovno terminologijo, osnove razumevanja gradbene stroke.</li> <li>• Poznavanje standardizirane delitve gradbenih objektov in klasifikacije gradbene dejavnosti.</li> <li>• Seznanitev z osnovnimi značilnostmi in pomenom pomembnih elementov stavb in inženirskih gradenj ter lastnosti materialov, ter objektov in naprav gospodarske javne infrastrukture.</li> <li>• Poznavanje vloge geodezije pri vzpostavitvi zbirnega katastra gospodarske javne infrastrukture.</li> <li>• Poznavanje organizacijske sheme in načina vodenja zbirnega katastra gospodarske javne infrastrukture.</li> </ul> | <ul style="list-style-type: none"> <li>• Students understand professional terminology, basics tasks and concept of civil engineering.</li> <li>• Understanding of the standard classification of structures and the classification of activities in civil engineering.</li> <li>• Basic characteristics and importance of the construction elements of buildings and engineering structures; significance of the structures and devices in the public technical infrastructure.</li> <li>• They understand the role and importance of geodesy in the establishment and management of the cadastre of public infrastructure facilities.</li> </ul> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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

|                                       |                                                                                |
|---------------------------------------|--------------------------------------------------------------------------------|
| Predavanja, seminarsko delo na vajah. | Lectures are ex-cathedra. Exercises are in the form of seminars and home work. |
|---------------------------------------|--------------------------------------------------------------------------------|

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

|                              |         |                                 |
|------------------------------|---------|---------------------------------|
| Projekt (seminarska naloga)  | 30,00 % | Tutorial                        |
| Pisni izpit (teoretičen del) | 70,00 % | Written exam (theoretical part) |

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

SAVŠEK, Simona, AMBROŽIČ, Tomaž, MARJETIČ, Aleš, KREGAR, Klemen, ŠTEBE, Gašper, KOLER, Božo, GORŠIČ, Janez. *76. izmera HC Formin in jezovne zgradbe v Markovcih: geodetska izmera horizontalnih in vertikalnih premikov geodetskih točk*. Ljubljana: Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo, Katedra za geodezijo, 2021. 29 str., [11] pril., barvne ilustr.

STERLE, Oskar, PAVLOVČIČ PREŠEREN, Polona, KUCHAR, Miran, RITLOP, Klemen, MARJETIČ, Aleš, KREGAR, Klemen, ŠTEBE, Gašper, AMBROŽIČ, Tomaž, SAVŠEK, Simona, KOGIČ, Dušan. *Tehnično poročilo izvedbe geodetske izmere portalnih mrež in izračun koordinat točk v izbranem koordinatnem sistemu 2TDK*. Ljubljana: Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo, Katedra za geodezijo, 2021. 173 str., ilustr.

SAVŠEK, Simona, FLERIN, Matjaž, KREGAR, Klemen, KOGOT, Dušan. Geodetska izmera fasad stavb za namen energetske sanacije = Geodetic evaluation of building facades for the purpose of energy renovation. *Geodetski vestnik : glasilo Zveze geodetov Slovenije*. [Tiskana izd.]. 2018, letn. 62, št. 2, str. 201-217, ilustr. ISSN 0351-0271. [http://geodetski-vestnik.com/62/2/gv62-2\\_savsek.pdf](http://geodetski-vestnik.com/62/2/gv62-2_savsek.pdf), DOI: [10.15292/geodetski-vestnik.2018.02.201-217](https://doi.org/10.15292/geodetski-vestnik.2018.02.201-217).

LIPAR, Peter, ŽURA, Marijan, MARSETIČ, Rok, STRNAD, Irena, RIJAVEC, Robert, DETELLBACH, Simon. *Kapacitetna analiza priključka Arja vas: končno poročilo*. Ljubljana: Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo, Prometnotehniški inštitut, 2019. 48 f., [24] f. pril., ilustr. [COBISS.SI-ID [8922977](#)]

LIPAR, Peter, ŠEMROV, Darja. Sustainable design of cycling infrastructure. *ITE journal*. avg. 2018, letn. 88, št. 8, str. 24-28, ilustr. ISSN 0162-8178.

LIPAR, Peter. Strategija razvoja prometne infrastrukture v Republiki Sloveniji. V: ŽNIDARIČ, Aleš (ur.), ŠEMROV, Darja (ur.). *Referati = Proceedings*. 14. slovenski kongres o prometu in prometni infrastrukturi, Portorož, 24.-26. oktobra 2018. Ljubljana: DRC - Družba za raziskave v cestni in prometni stroki Slovenije, 2018. Ilustr. ISBN 978-961-6527-31-6.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                          |
|----------------------|------------------------------------------|
| <b>Predmet:</b>      |                                          |
|                      | <b>DETAJLNA IZMERA</b>                   |
| <b>Course title:</b> |                                          |
|                      | <b>TOPOGRAPHIC SURVEYING AND MAPPING</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 1. letnik | Letni    |

Univerzitetna koda predmeta/University course code:

1798

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

Nosilec predmeta/Lecturer:

Miran Kuhar, Tomaž Ambrožič

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:

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Vsebina:

Content (Syllabus outline):

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| <ul style="list-style-type: none"> <li>Osnovni koordinatni sistemi v geodeziji; državni horizontalni in višinski sistem; državna kartografska projekcija.</li> <li>Detajlna topografska geodetska izmera: namen in delitev metod izmere.</li> <li>Postopki izmere, planiranje, izvedba, kodiranje, skica, izvednotenje, izris, kartiranje,</li> <li>Vsebina in namen topografskih načrtov, razdelitev na detajlne liste, nomenklatura topografskih načrtov, izvenokvirna vsebina topografskih načrtov, višinska predstavitev terena na topografskih načrtih, interpolacija plastnic, natančnost prikaza.</li> </ul> | <ul style="list-style-type: none"> <li>Basics in the coordinate systems within surveying: terrestrial, national horizontal and vertical coordinate system, national cartographic projection.</li> <li>A detailed land survey: the purpose and methods of surveying division.</li> <li>Geodetic networks as realization of the coordinate system.</li> <li>The content and purpose of geodetic plans, rules of surveying plan, detailed breakdown on the sheets, nomenclature geodetic plans, mapping, terrain elevation presentation on geodetic plans, accuracy, calculation of surfaces,</li> </ul> |
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| <ul style="list-style-type: none"> <li>Izris načrta detaljne izmere v računalniškem programu.</li> <li>Geodetsko orodje: trasirke, libele, grezila.</li> <li>Zgradba in pogoji delovanja teodolita, elektrooptičnega razdaljemera, metode in pogreški izmere horizontalnih kotov, pogreški in popravki dolžin.</li> <li>Trigonometrično višinomerstvo, geometrični nivelman.</li> <li>Zgradba in pogoji nivelirja.</li> <li>Izračun linijskega in zaključenega nivelmanskega vlaka.</li> <li>Določitev koordinatne osnove za izvedbo detaljne izmere; metode določitve koordinat točk v ravnini, poligon priklepni, zaključeni, prosto stojišče.</li> <li>Uvod v GNSS tehnologijo; osnovni principi določanja položaja v GNSS sistemih.</li> <li>Praktična izvedba RTK geodetske izmere.</li> <li>Kombinacija klasične in GNSS detaljne izmere.</li> <li>Osnove transformacije koordinat; Helmertova transformacija v ravnini.</li> </ul> | <p>shrinkage of detailed data sheet, digitalization of geodetic plans.</p> <ul style="list-style-type: none"> <li>Methods of measuring, planning, design, coding, drawing, evaluation of plotting, mapping.</li> <li>Surveying and mapping tool: range poles, plumb bobs, levels.</li> <li>Composition and functional conditions of the theodolite, electro-optical distance meter, methods and errors of measurement of horizontal angles, errors and corrections of lengths.</li> <li>Trigonometric leveling, geometric leveling, composition and functional constructions of the level instruments.</li> <li>Calculation of point coordinates for detailed surveying: traverse, resection and intersection, free station.</li> <li>Introduction to GNSS technology: absolute and relative positioning, differential GPS positioning,</li> <li>Detail RTK GNSS surveying and</li> <li>Combination of classical and GNSS mapping survey.</li> <li>Introduction to coordinate transformation, Helmert transformation in 2D.</li> </ul> |
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#### Temeljna literatura in viri/Readings:

Kahmen, H., Faig, W. 1988. Surveying, Berlin, New York, Walter de Gruyter.

Kogoj, D., Stopar, B. Geodetska izmera. Gradivo za strokovni izpit iz geodetske stroke, Ljubljana, Inženirska zbornica Slovenije, Matična sekcija geodetov.

Dostopno na: [http://www.e-prostor.gov.si/fileadmin/ogs/GEODETSKA\\_IZMERA.pdf](http://www.e-prostor.gov.si/fileadmin/ogs/GEODETSKA_IZMERA.pdf).

Kuhar, M. 2013. Detaljna izmera, prosojnice s predavanj in izbrana poglavja.

Topografski ključ za izdelavo in prikaz vsebine geodetskih načrtov, Ljubljana, GURS, 2006 (dostopno na spletni učilnici).

Učno gradivo v spletni učilnici UL FGG.

#### Cilji in kompetence:

##### Cilji:

- seznaniti študenta s tehnologijami za izvedbo detaljne topografske geodetske izmere,
- seznaniti z načeli in postopki izvedbe različnih tipov terestrične in satelitsko podprte detaljne topografske geodetske izmere, obdelave podatkov opazovanj, ter hkratnega pridobivanja podatkov klasičnih terestričnih in satelitsko podprtih opazovanj v geodeziji.

##### Kompetence:

- študent pridobi znanja, ki jih potrebuje za izdelavo enostavnega topografskega načrta.

#### Objectives and competences:

##### Objectives:

- to acquaint the student with modern technologies to carry out detailed land survey, with the principles and procedures for the implementation of various types of terrestrial and satellite-based detailed land survey, and data processing of observations, assessment of the quality of observations, and simultaneous data acquisition by traditional terrestrial and satellite-based observations in surveying.

##### Competences:

- students will acquire knowledge and competences they need to make a simple geodetic plan and basic graphic presentation associated primarily with the design and

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|  | construction of new facilities at the stage of the project documentation for the aim of obtaining a building permit and technical documentation for the purpose of registration in official records. |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| <ul style="list-style-type: none"> <li>• Znanje in razumevanje osnovnih pojmov, zakonitosti in postopkov topografske terestrične in satelitsko podprte detajlne geodetske izmere,</li> <li>• znanje in razumevanje preprostih postopkov v nalogah kombinirane terestrične in satelitsko podprte geodetske izmere v geodetski praksi,</li> <li>• pridobitev znanja o namenu in vsebini izdelave topografskih načrtov detajlne izmere ter njihove uporabe v praksi.</li> <li>• spoznajo pomen topografskega načrta kot osnovnega geodetskega grafičnega prikaza v fazi izdelave projektne in tehnične dokumentacije v povezavi z veljavno zakonodajo (ZgeoD1, Zgo-1, Zurep idr.) in</li> <li>• spoznajo veljavni Topografski ključ za izdelavo topografskega načrta detajlne izmere.</li> </ul> | <ul style="list-style-type: none"> <li>• They are acquainted with the Rules of geodetic plan and applicable Topographic key for the elaboration of the geodetic plan regarding the purpose and use,</li> <li>• knowledge and understanding of basic concepts and procedures of the detailed terrestrial and detailed satellite-based geodetic measurements; and simple procedures in tasks of combined terrestrial and satellite-based geodetic measurements in surveying practice,</li> <li>• they gain knowledge of the purpose and content of elaborating geodetic plans and their application in practice and</li> <li>• they learn about the importance of geodetic plan as the basic geodetic graphic display at the elaboration of stage design and technical documentation in connection with the applicable legislation.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                                                                                                                                                                                             |                                                                                                                                                                           |
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| Predavanja potekajo v obliki ex-katedra z uporabo sodobnih učnih pripomočkov, grafičnih prikazov, demonstracij in primerov iz prakse. Praktične vaje potekajo v obliki praktičnih vaj na terenu in v računalniški učilnici. | Lectures are ex-cathedra. Exercises consist of combination of the field work (detail survey measurements) and elaboration of measurements data in the computer classroom. |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                                          |         |                                                |
|------------------------------------------|---------|------------------------------------------------|
| Domače naloge in sprotno delo.           | 40,00 % | Homeworks in everyday progress                 |
| Pisni izpit (teoretičen in računski del) | 60,00 % | Written exam (theoretical and practical part). |

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

KOLER, Božo, MEDVED, Klemen, KUHAR, Miran. The new fundamental gravimetric network of Slovenia. Acta geodaetica et geophysica Hungarica, ISSN 1217-8977, 2012, letn. 47, št. 3, str. 271-286, ilustr.

KUHAR, Miran, OKORN, Marta, STOPAR, Bojan. Določitev odklonov navpičnic iz geoidnih višin = Determination of deflection of the vertical from geoid heights. Geodetski vestnik, ISSN 0351-0271. [Tiskana izd.], 2010, letn. 54, št. 4, str. 595-605, ilustr. [http://www.geodetski-vestnik.com/54/4/gv54-4\\_595-605.pdf](http://www.geodetski-vestnik.com/54/4/gv54-4_595-605.pdf).

MARJETIČ, Aleš, AMBROŽIČ, Tomaž, TURK, Goran, STERLE, Oskar, STOPAR, Bojan. Statistical Properties of Strain and Rotation Tensors in Geodetic Network. Journal of surveying engineering, ISSN 0733-9453, avgust 2010, letn. 136, št. 3, str. 102-110, ilustr., doi: 10.1061/(ASCE)SU.1943-5428.0000020.

SAVŠEK, Simona, GREGORN, Zoran, AMBROŽIČ, Tomaž. Measuring meteorological data along the ray path of a distance meter with an ultra-light aircraft. Survey review, ISSN 0039-6265, 2013, letn. 45, št. 328, str. 3-12, ilustr., doi: 10.1179/1752270612Y.0000000008.

STERLE, Oskar, PAVLOVČIČ PREŠEREN, Polona, KUCHAR, Miran, STOPAR, Bojan. Definicija, realizacija in vzdrževanje modernih koordinatnih sistemov = Definition, realization and maintenance of modern coordinate systems. Geodetski vestnik, ISSN 0351-0271. [Tiskana izd.], 2009, letn. 53, št. 4, str. 679-694, ilustr. Dostopno na: [http://www.geodetski-vestnik.com/53/4/gv53-4\\_679-694.pdf](http://www.geodetski-vestnik.com/53/4/gv53-4_679-694.pdf).

VEZOČNIK, Rok, AMBROŽIČ, Tomaž, STERLE, Oskar, BILBAN, Gregor, PFEIFER, Norbert, STOPAR, Bojan. Use of Terrestrial Laser Scanning Technology for Long Term High Precision Deformation Monitoring. Sensors, ISSN 1424-8220, 2009, letn. 9, št. 12, str. 9874-9895, ilustr. <http://www.mdpi.com/1424-8220/9/12/9873/pdf>, doi: 10.3390/s91209873

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                       |
|----------------------|---------------------------------------|
| <b>Predmet:</b>      |                                       |
|                      | <b>STATISTIČNE METODE V GEODEZIJ</b>  |
| <b>Course title:</b> |                                       |
|                      | <b>STATISTICAL METHODS IN GEODESY</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 1. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1035 |
|------------------------------------------------------------|------|

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

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

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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>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <ul style="list-style-type: none"> <li>Uvod v statistiko, predstavitev podatkov; opisna statistika (grafične predstavitve in numerične predstavitve prostorskih in drugih podatkov),</li> <li>opisna statistika (kvantili, frekvenčna porazdelitev, podatki v razredih),</li> <li>osnove verjetnosnega računa (uvod, dogodek, verjetnost dogodka),</li> <li>slučajne spremenljivke in slučajni vektorji,</li> <li>momenti slučajnih spremenljivk in njihovih funkcij,</li> <li>verjetnostne porazdelitve, ki jih najpogosteje srečamo v geodeziji,</li> </ul> | <ul style="list-style-type: none"> <li>Introduction to statistics, statistical data,</li> <li>descriptive statistics (graphical and numerical representation of spatial and other data),</li> <li>descriptive statistics (quantiles, frequency distribution, data in classes),</li> <li>theory of probability (Introduction, event, probability of an event),</li> <li>random variables and random vectors,</li> <li>moments of random variables and their functions,</li> <li>distributions often used in geodesy,</li> <li>normal distribution,</li> </ul> |

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| <ul style="list-style-type: none"> <li>• normalna porazdelitev, kot najpomembnejša porazdelitev v geodeziji,</li> <li>• vzorčenje (lastnosti osnovnih statistik, povprečje vzorca, varianca vzorca), ocenjevanje parametrov (točkovne in intervalne ocene),</li> <li>• preizkušanje domnev (osnove teorije preizkušanja domnev, ki so pogosto uporabljane v analizah stabilnosti geodetskih točk, klasični primeri preizkušanja domnev, preizkušanje skladnosti test "hi-kvadrat"),</li> <li>• bivariatna analiza (preizkušanje statistične odvisnosti, preizkušanje linearne povezanosti, linearna regresija, uporaba metode najmanjših kvadratov, ki je ena izmed osnov izravnalnega računa v geodeziji) in</li> <li>• analiza variance s primeri v geodetski praksi.</li> </ul> | <ul style="list-style-type: none"> <li>• sampling (characteristics of basic statistics, sample mean and variance),</li> <li>• parameter estimation (point and interval estimates),</li> <li>• hypothesis testing (introduction, statistical test often used in geodesy, general statistical test, e.g. hi-squared goodness-of-fit test),</li> <li>• bivariate analyses (hypothesis testing of statistical and linear independence, linear regression, the use of least squares method) and</li> <li>• analysis of variance (ANOVA) with some examples from geodesy.</li> </ul> |
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**Temeljna literatura in viri/Readings:**

Drobne S., Turk, G. 2009. Statistika - vaje, 2. dopolnjena izdaja. Ljubljana, UL FGG.

Turk G. 2012. Verjetnostni račun in statistika. Ljubljana UL FGG.

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

- cilj predmeta je spoznati osnovne pojme verjetnostnega računa in statistične metode, pogosto uporabljane v geodeziji.

**Kompetence:**

- pozna načine grafičnega in numeričnega prikaza podatkov,
- pozna pomen in tehnike razvrščanja podatkov v razrede,
- pozna osnovne pojme verjetnostnega računa: slučajne spremenljivke, njihove lastnosti, statistične odvisnosti, porazdelitve,
- pozna v geodeziji najpogosteje uporabljene porazdelitve s posebnim poudarkom na normalni porazdelitvi,
- pozna in razume pomen statistike kot ocene parametrov populacije in
- pozna osnovne statistične metode, ki jih uporabljamo v geodeziji.

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

- student learns about basics of theory of probability and statistical methods often used in geodesy.

**Competences:**

- knows how to present statistical data graphically and numerically,
- knows the meaning and techniques of data distribution in classes,
- knows the basics of the theory of probability: random variables and their characteristics, statistical independence, distributions,
- knows statistical distributions most commonly used in geodesy with specific emphasis on normal distribution,
- knows and understands the meaning of statistics and population parameters estimations and
- knows basic statistical methods which are commonly used in geodesy.

**Predvideni študijski rezultati:**

- Študent razume osnovne pojme verjetnostnega računa, pozna porazdelitvene zakone, pogosto uporabljane v geodeziji.
- Spozna osnovne statistične metode, kot so intervali zaupanja, preizkušanje domnev, bivariatna analiza in analiza variance.

**Intended learning outcomes:**

- Student understands the basic concepts of theory of probability, knows basic statistical distributions commonly used in geodesy.
- Learns about the basic statistical methods, i.e. confidence intervals, hypothesis testing, bivariate analysis, ANOVA.

|                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                             |
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| <ul style="list-style-type: none"> <li>• Samostojno izbira ustrezno statistično metodo glede na obravnavani problem in jo samostojna izvede.</li> <li>• Razume, kaj so prednosti (in slabosti) podajanja zaključkov z določenim nivojem tveganja.</li> </ul> | <ul style="list-style-type: none"> <li>• Student is able to choose the most suitable statistical methods with respect to the problem and is able to perform the analysis.</li> <li>• Understands the shortcomings and advantages of forming the conclusions based on risk level.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

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| Polovica poučevanja predstavljajo predavanja s pogosto uporabo modernih učnih pripomočkov: prikazi programske opreme, simulacij in drugo. Druga polovica so vaje, ki jih opravimo v računalniški učilnici, v okviru katerih študent rešuje relativno preproste naloge iz verjetnostnega računa in statistike. | One half of the teaching is performed through the lectures with often use of modern teaching techniques: demonstration of statistical software, simulations, etc. The second half is teaching and learning in the computer lab where relatively simple problems of probability theory and statistics are solved. |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                                                                                                |         |                                                                                                                          |
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| Ustni (teoretični) del izpita                                                                  | 40,00 % | Final exam, theoretical part – oral examination                                                                          |
| Naloge in sprotno delo (pogoj za pristop k računskemu delu izpita) Pisni (računski) del izpita | 60,00 % | Exercise (requirements which has to be fulfilled before the final exam) Final exam, practical part – written examination |

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

DROBNE Samo in TURK Goran., 2009. Statistika - vaje, II. dopolnjena izdaja, UL-FGG, Ljubljana.

KREGAR Klemen, TURK, Goran, KOGOJ, Dušan. Statistical testing of directions observations independence. Surv. rev. - Dir. Overseas Surv., 2013, letn. 45, št. 329, str. 117-125.

MARJETIČ Aleš, AMBROŽIČ, Tomaž, TURK Goran, STERLE, Oskar, STOPAR, Bojan. Statistical Properties of Strain and Rotation Tensors in Geodetic Network. J. surv. eng., avgust 2010, letn. 136, št. 3, str. 102-110.

TURK Goran, 2012. Verjetnostni račun in statistika, UL-FGG, Ljubljana.

ZUPAN, Dejan, SRPČIČ, Jelena, TURK, Goran. Characteristic value determination from small samples. Struct. saf., letn. 29, št. 4, str. 268-278, 2007.

ZUPAN, Dejan, TURK, Goran. Characteristic value determination for arbitrary distribution. V: BREBBIA, Carlos Alberto (ur.). Risk analysis IV, (Management information systems, Vol. 9). Southampton; Boston: WIT Press, str. 503-512, 2004.

ZUPAN, Dejan, TURK, Goran. Nepristranska točkovna ocena karakterističnih vrednosti = Unbiased point estimate of characteristic value. Gradb. vestn., let. 50, str. 206-214, 2001.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                  |
|----------------------|----------------------------------|
| <b>Predmet:</b>      |                                  |
|                      | <b>IZRAVNALNI RAČUN I</b>        |
| <b>Course title:</b> |                                  |
|                      | <b>ADJUSTMENT COMPUTATIONS I</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri    |
|----------------------------------------------------------|---------------------------------|-----------|-------------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 1. letnik | 2. semester |

|                                                            |         |
|------------------------------------------------------------|---------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 0033798 |
| <b>Koda učne enote na članici/UL Member course code:</b>   | 1586    |

| 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> | Bojan Stopar |
|-----------------------------------|--------------|

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| <b>Vrsta predmeta/Course type:</b> | Obvezni splošni /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>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <ul style="list-style-type: none"> <li>Pojem opazovanj, osnovne lastnosti opazovanj, pravi pogrešek, popravek.</li> <li>Pojem matematičnega modela, vključitev opazovanj v matematični model.</li> <li>Delitev matematičnega modela: funkcijski, stohastični model.</li> <li>Pogreški opazovanj: delitev, predstavitev.</li> <li>Osnovni pojmi verjetnosti, definicija verjetnosti.</li> <li>Prava vrednost, srednja vrednost, standardni odklon, varianca.</li> <li>Merila kakovosti opazovanj v geodeziji, osnovni pojmi: natančnost, točnost, zanesljivost.</li> </ul> | <ul style="list-style-type: none"> <li>The concept of observation, basic properties of observations, true error, residual.</li> <li>The concept of a mathematical model, inclusion of observations in a mathematical model.</li> <li>The division of the mathematical model: functional and stochastic model.</li> <li>Errors of observation: division, presentation.</li> <li>Basic concepts of probability, definition of probability.</li> <li>True value, mean value, standard deviation, variance.</li> </ul> |

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| <ul style="list-style-type: none"> <li>• Prenos pravih pogreškov.</li> <li>• Linearizacija nelinearnih problemov.</li> <li>• Pojem izravnave matematični model: funkcionalni in stohastični model.</li> <li>• Metoda najmanjših kvadratov, izravnavo po metodi najmanjših kvadratov.</li> <li>• Pojem uteži opazovanj.</li> <li>• Normalna porazdelitev kot osnovni verjetnostni model opazovanj v geodeziji.</li> <li>• Variančno kovariančna matrika, matrika kofaktorjev, matrika uteži.</li> <li>• Posredna izravnavo opazovanj po metodi najmanjših kvadratov, iterativno reševanje lineariziranega problema, vključitev opazovanj v izravnavo.</li> <li>• Pogojna izravnavo opazovanj po metodi najmanjših kvadratov, vključitev opazovanj v izravnavo.</li> </ul> | <ul style="list-style-type: none"> <li>• Quality criteria of observations in geodesy, basic concepts of quality: precision, accuracy, reliability.</li> <li>• Propagation of true errors.</li> <li>• Linearization of nonlinear problems.</li> <li>• The concept of adjustment in mathematical model: functional and stochastic model.</li> <li>• The method of least squares, adjustment according to the least squares method principles.</li> <li>• The concept of observation weights.</li> <li>• Normal distribution as the basic probabilistic model of observations in geodesy and surveying.</li> <li>• Variance-covariance matrix, cofactor matrix, weight matrix.</li> <li>• Indirect adjustment of observations by the least squares method, iterative solution of the linearized problem, inclusion of observations in mathematical model.</li> <li>• Conditional adjustment of observations by the least squares method, inclusion of observations in mathematical model.</li> </ul> |
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**Temeljna literatura in viri/Readings:**

Mikhail, E. 1976. Observations and least squares. New York, IEP Publishing.

Mikhail, E. 1981. Analysis and adjustment of survey measurements, New York, Van Nostrand Reinhold.

Stopar, B., Sterle, O. 2013. Izravnalni račun, skripta v pripravi, Spletna učilnica UL FGG.

Wolf, P.R., Ghilani, C.D. 2006. Adjustment computations, statistics, least squares in surveying and GIS. Hoboken, New Jersey, John Wiley & Sons.

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

- razumevanje pojma in koncepta meritev ter njihovih lastnosti,
- razumevanje enostavnih načinov reševanja predloženih problemov po metodi najmanjših kvadratov in
- razumevanje meril za vrednotenje kakovosti meritev ter funkcij meritev v osnovnih praktičnih nalogah v geodeziji.

**Kompetence:**

- spoznavanje temeljnih vsebin in pojmov povezanih z meritvami v geodeziji,
- razumevanje ciljev in namena izvajanja meritev,
- spoznavanje postopkov za opis in uporabo verjetnostnih lastnosti meritev v geodeziji,
- spoznavanje koncepta matematičnega modela ter njegove delitve na funkcijski in stohastični model,
- spoznavanje koncepta metode najmanjših kvadratov,

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

- understanding the concept of measurements and their properties,
- understanding simple ways of solving overdetermined problems by the least squares method and
- understanding the criteria for evaluating the quality of measurements and functions of measurements in basic practical tasks in geodesy and surveying.

**Competences:**

- introduction to the basic concepts and topics related to measurements in geodesy and surveying,
- understanding the objectives and purposes of measurement,
- introduction to the procedures for the description and use of statistical properties of measurements in geodesy and surveying,

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| <ul style="list-style-type: none"> <li>• spoznavanje koncepta problema posredne in pogojne izravnave in</li> <li>• razumevanje pojmov natančnost, točnost, zanesljivost in pravilnost.</li> </ul> | <ul style="list-style-type: none"> <li>• introduction to the concept of a mathematical model and its division into functional and stochastic model,</li> <li>• introduction to the concepts of the least squares method.</li> <li>• Introduction to the concept of the problem of indirect and conditional adjustment and</li> <li>• understanding the concept of precision, accuracy, reliability and trueness.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

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| <ul style="list-style-type: none"> <li>• Seznanitev s strokovno terminologijo na področju predmeta, osnove razumevanja koncepta meritev. Razumevanje povezav koncepta meritev ter verjetnosti in statistike.</li> <li>• Razumevanje koncepta nadštevilnih meritev, razlogov za izvedbo nadštevilnih meritev ter pojma izravnave nadštevilnih meritev.</li> <li>• Razumevanje metode najmanjših kvadratov. Razumevanje lastnosti in uporabe enostavnih tehnik izravnave.</li> <li>• Sposobnost za vrednotenje kakovosti opazovanj in funkcij le-teh na osnovnem nivoju.</li> <li>• Usposobljenost za reševanje praktičnih problemov izravnave ter usposobljenost za osnovno vrednotenje kakovosti rezultatov, pridobljenih i izravnavo.</li> </ul> | <ul style="list-style-type: none"> <li>• Understanding the basic terminology of the course. Understanding the concept of measurements related to probability and statistics.</li> <li>• Understanding the concept of redundant measurements, the reasons for performing redundant measurements and the concept of adjustment of redundant measurements.</li> <li>• Understanding the method of least squares. Understanding the basic properties and use of basic adjustment techniques.</li> <li>• Ability to evaluate the quality of observations and their functions at the basic level.</li> <li>• Ability to solve practical adjustment problems with the basic evaluation of the quality of the obtained results.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

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| <p>Predavanja potekajo v obliki ex-katedra z uporabo sodobnih učnih pripomočkov.</p> <p>Praktične vaje potekajo v obliki seminarskih vaj v učilnici.</p> | <p>Lectures take place in the form of ex-cathedra using teaching aids.</p> <p>Practical tutorials take the form of practical exercises in the classroom.</p> |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                              |         |                               |
|------------------------------|---------|-------------------------------|
| Ustni izpit (teoretičen del) | 50,00 % | Oral exam (theoretical part)  |
| Pisni izpit (praktičen del)  | 50,00 % | Written exam (practical part) |

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

MARJETIČ, Aleš, AMBROŽIČ, Tomaž, TURK, Goran, STERLE, Oskar, STOPAR, Bojan. Statistical Properties of Strain and Rotation Tensors in Geodetic Network. J. surv. eng., avgust 2010, letn. 136, št. 3, str. 102-110, ilustr., doi: 10.1061/(ASCE)SU.1943-5428.0000020.

SAVŠEK, Simona, AMBROŽIČ, Tomaž, STOPAR, Bojan, TURK, Goran. Determination of Point Displacements in the Geodetic Network. J. surv. eng., 2006, letn. 132, št. 2, str. 58-63, graf. prikazi.

STOPAR, Bojan. Second order design of horizontal GPS net. Surv. rev. - Dir. Overseas Surv., 2001, vol. 36, no. 279, str. 44-53, ilustr.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                   |
|----------------------|-----------------------------------|
| <b>Predmet:</b>      |                                   |
|                      | <b>IZRAVNALNI RAČUN II</b>        |
| <b>Course title:</b> |                                   |
|                      | <b>ADJUSTMENT COMPUTATIONS II</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri    |
|----------------------------------------------------------|---------------------------------|-----------|-------------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 2. letnik | 1. semester |

|                                                            |         |
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| <b>Univerzitetna koda predmeta/University course code:</b> | 0033803 |
| <b>Koda učne enote na članici/UL Member course code:</b>   | 1645    |

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

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

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

|                                                                                                              |                                                                                                          |
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| Opravljen izpit iz predmetov Matematika 1, Matematika 2, Statistične metode v geodeziji, Izravnalni račun 1. | Passed exams in Mathematics I, Mathematics II, Statistical methods in geodesy, Adjustment computations I |
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**Vsebina:****Content (Syllabus outline):**

|                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| <ul style="list-style-type: none"> <li>Prenos varianc in kovarianc, zakon o prenosu varianc in kovarianc.</li> <li>Prenos varianc in kovarianc pri posredni in pogojni izravnavi.</li> <li>Določitev potrebne natančnosti opazovanj.</li> <li>Splošni model izravnave.</li> <li>Posredna in pogojna izravnavi kot posebna primera splošnega modela izravnave.</li> <li>Prenos varianc in kovarianc pri splošnem modelu izravnave.</li> </ul> | <ul style="list-style-type: none"> <li>Propagation of variances and covariances, the law of variance - covariance propagation.</li> <li>The variance - covariance propagation in terms of indirect and conditional adjustment.</li> <li>Estimation of needed precision of surveying measurements.</li> <li>General least squares adjustment.</li> <li>Indirect and conditional adjustment as special cases of the general least squares adjustment.</li> </ul> |
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| <ul style="list-style-type: none"> <li>• Normalna porazdelitev 2 skupno porazdeljenih slučajnih spremenljivk.</li> <li>• Elipsa pogreškov, elipsoid pogreškov, elipsa zaupanja, elipsoid zaupanja.</li> <li>• Absolutna in relativna elipsa pogreškov. Vzorčne statistike, vzorčne porazdelitve verjetnosti (t-porazdelitev, hi-kvadrat-porazdelitev).</li> <li>• Uporabnost testov sredine in variance porazdelitve verjetnosti v geodeziji.</li> <li>• Uporaba statističnih testov v vrednotenju opazovanj in rezultatov izravnav.</li> <li>• Predhodna analiza opazovanj.</li> <li>• Števila nadštevilnosti, matrika nadštevilnosti: definicije, pomen, uporaba.</li> <li>• Vrednotenje kakovosti rezultatov izravnav: lokalna, globalna merila natančnosti.</li> <li>• Ugotavljanje prisotnosti grobih pogreškov v opazovanjih: globalni test modela, data snooping, tau-test.</li> </ul> | <ul style="list-style-type: none"> <li>• Variance and covariance propagation in the general least squares adjustment.</li> <li>• The normal distribution of two commonly distributed random variables.</li> <li>• Error ellipse, error ellipsoid, confidence ellipse confidence ellipsoid. Absolute and relative error ellipses.</li> <li>• Sample statistics, sample probability distribution (t- distribution, chi- square distribution).</li> <li>• Statistical tests of mean value and variance of the probability distribution with application in geodesy and surveying.</li> <li>• Using statistical testing in the evaluation of observations and adjustment results.</li> <li>• Preliminary analysis of observations.</li> <li>• Redundancy number, redundancy matrix: definitions, importance, applications.</li> <li>• Evaluation of the quality of adjustment results: local and global precision measures.</li> <li>• Detection of gross errors in observations: global test of the model, data snooping, tau -test.</li> </ul> |
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**Temeljna literatura in viri/Readings:**

Mikhail, E. 1976. Observations and least squares. New York, IEP Publishing.

Mikhail, E. 1981. Analysis and adjustment of survey measurements, New York, Van Nostrand Reinhold.

Stopar, B., Sterle, O. 2013. Izravnalni račun, skripta v pripravi. Učno gradivo v spletni učilnici UL FGG.

Wolf, P.R., Ghilani, C.D. 2006. Adjustment computations, statistics, least squares in surveying and GIS. Hoboken, New Jersey, John Wiley & Sons.

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

- razumevanje postopkov za vzpostavitev stohastičnega modela izravnav,
- razumevanje postopkov prenosa varianc in kovarianc za linearne in linearizirane nelinearne funkcije,
- razumevanje prenosa varianc in kovarianc pri izravnavi po metodi najmanjših kvadratov,
- spoznavanje pojmov in naprednih postopkov izravnav opazovanj v geodeziji,
- razumevanje pristopa k reševanju problemov v geodeziji ter kompleksnega vrednotenja pridobljenih rezultatov,
- razumevanje lastnosti treh tehnik izravnav, sposobnost izbire ustrezne tehnike izravnav,
- vrednotenje ustreznosti rezultatov meritev glede na zastavljene kriterije s pomočjo globalnih in lokalnih meril kakovosti in
- celovito obvladovanje kakovosti geodetskih meritev v praktičnih nalogah v geodeziji.

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

- understanding procedures for stochastic model set up,
- understanding variance covariance propagation law for linear and linearized nonlinear functions,
- understanding variance covariance propagation in least squares adjustment,
- getting to know the advanced concepts and techniques of adjustment of observations in geodesy in surveying,
- understanding the principles of three basic adjustment techniques, understanding the procedures for solving advanced problems and evaluation of the obtained results,
- evaluation of the adjustment results with respect to the criteria through global and local quality measures and
- quality management of measurements in the practical tasks of geodesy and surveying.

**Competences:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| <ul style="list-style-type: none"> <li>• poglobljeno poznavanje vsebin in pojmov povezanih z izravnavo meritev v geodeziji,</li> <li>• razumevanje in razlikovanje uporabnosti različnih tehnik izravnave po metodi najmanjših kvadratov in poznavanje postopkov za praktično reševanje problemov izravnave z uporabo metode najmanjših kvadratov,</li> <li>• spoznavanje možnosti predhodne analize opazovanj ter priprave podatkov meritev za uporabo v izravnavi, spoznavanje postopkov vrednotenja meritev na osnovi lastnosti matrike nadštevilnosti in</li> <li>• usposobljenost za vrednotenje kakovosti pridobljenih rezultatov na osnovi lokalnih in globalnih meril kakovosti, zmožnost reševanja kompleksnih praktičnih problemov s celovitim obvladovanjem kakovosti.</li> </ul> | <ul style="list-style-type: none"> <li>• on-depth knowledge of the contents and concepts relating to the adjustment of observation in geodesy and surveying,</li> <li>• understand and differentiating the practical usage of different adjustment techniques with the method of least squares, knowledge of the practical procedures for solving problems in adjustment using the method of least squares,</li> <li>• understand the importance of a pre-analysis of Observation data to be used in the adjustment, understand the evaluation of measurement procedures based on the redundancy matrix and</li> <li>• ability to evaluate the quality of the results obtained on the basis of local and global quality measures and ability to solve advanced practical problems of total quality management.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

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| <ul style="list-style-type: none"> <li>• Razumevanje kompleksnih pristopov k reševanju problema izravnave.</li> <li>• Razumevanje razlogov, ki omogočajo izbiro ustrezne tehnike izravnave.</li> <li>• Razumevanje povezanosti tehnik izravnave po metodi najmanjših kvadratov.</li> <li>• Razumevanje meril kakovosti: lokalnih, globalnih, absolutnih, relativnih.</li> <li>• Razumevanje postopkov, ki omogočajo nadzor nad prisotnostjo grobo pogrešenih opazovanj pred in po izravnavi ter šibkosti in omejitve teh postopkov. Usposobljenost za praktično reševanje kompleksnih problemov izravnave.</li> </ul> | <ul style="list-style-type: none"> <li>• Understanding the advanced approaches to solving adjustment problem.</li> <li>• Understanding the reasons for the selection of appropriate adjustment technique.</li> <li>• Understanding the relations among the least squares adjustment techniques.</li> <li>• Understanding the main quality measures: local, global, absolute, relative.</li> <li>• Understanding the procedures for the estimation of the presence of gross error of observations before and after the adjustment, and understanding the weaknesses and limitations of these procedures.</li> <li>• Ability to solve advanced practical problems of adjustment.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                                        |                                                          |
|------------------------------------------------------------------------|----------------------------------------------------------|
| Predavanja, seminarske in laboratorijske vaje (računalniška učilnica). | Lectures, tutorials and laboratory work (computer room). |
|------------------------------------------------------------------------|----------------------------------------------------------|

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

|                              |         |                               |
|------------------------------|---------|-------------------------------|
| Pisni izpit (praktičen del)  | 50,00 % | Written exam (practical part) |
| Ustni izpit (teoretičen del) | 50,00 % | Oral exam (theoretical part)  |

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

MARJETIČ, Aleš, AMBROŽIČ, Tomaž, TURK, Goran, STERLE, Oskar, STOPAR, Bojan. Statistical Properties of Strain and Rotation Tensors in Geodetic Network. J. surv. eng., avgust 2010, letn. 136, št. 3, str. 102-110, ilustr., doi: 10.1061/(ASCE)SU.1943-5428.0000020.

SAVŠEK, Simona, AMBROŽIČ, Tomaž, STOPAR, Bojan, TURK, Goran. Determination of Point Displacements in the Geodetic Network. J. surv. eng., 2006, letn. 132, št. 2, str. 58-63, graf. prikazi.

STOPAR, Bojan. Second order design of horizontal GPS net. Surv. rev. - Dir. Overseas Surv., 2001, vol. 36, no. 279, str. 44-53, ilustr.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                               |
|----------------------|-------------------------------|
| <b>Predmet:</b>      |                               |
|                      | <b>PROSTORSKO NAČRTOVANJE</b> |
| <b>Course title:</b> |                               |
|                      | <b>SPATIAL PLANNING</b>       |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 2. letnik | letni    |

Univerzitetna koda predmeta/University course code:

1175

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

Nosilec predmeta/Lecturer:

Alma Zavodnik Lamovšek

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):

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Na predavanjih so podane osnovne informacije o urejanju prostora na ravni občine, regije in države; o metodah in tehnike timskega in interdisciplinarnega dela pri urejanju prostora, izvajanju planov in prostorskem managementu; prostorske inventarizacije, analize in vrednotenja.</li> <li>Predstavljena je okoljskanosilnost prostora, karte privlačnosti in zmogljivosti prostora; prikazane so rabe tal v urbanem in ruralnem prostoru ter prostorske zasnove razporeditve rabe tal za kmetijstvo, gozdarstvo, rudarstvo, naselitev, proizvodnjo, turizem in rekreacijo.</li> </ul> | <ul style="list-style-type: none"> <li>During lectures students are presented with background information on spatial planning at the levels of the municipality, region and state, and with methods and techniques of team and interdisciplinary work in spatial planning, execution of planning schemes and spatial management.</li> <li>Students are shown spatial inventory, analysis and evaluation; what is carrying capacity of the environment, spatial attractiveness and capacity maps. Also presented are urban and rural land use and spatial design of land use distribution for agriculture, forestry, mining, housing,</li> </ul> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Študenti se seznajajo z prostorsko razporeditvijo prometne, komunalne in energetske infrastrukture; z varstvom okolja, okoljevarstvena infrastrukturo in ocene vplivov na okolje ter z urejanjem krajine.</li> <li>• Obravnavane so urbane rabe tal, urbanistični načrt, zazidalni načrt, načrt prenove; izvajanje planov in kontrola; nelegalni posegi v prostor, dovoljevanje posegov v prostor.</li> <li>• Študentom se poskuša zagotoviti obisk pomembnejših planerskih zavodov in inštitutov. Prikaže se zbiranje in obdelava podatkov za manjše naselje ter analiza stanja oz. obstoječe rabe in okoljske nosilnosti, zasnova nove rabe tal in infrastrukturne opreme (kot vaje).</li> </ul> | <p>production, tourism and recreation; followed by spatial distribution of transport, municipal and energy infrastructure.</p> <ul style="list-style-type: none"> <li>• Students are given information on environmental protection, environmental infrastructure, risk assessment concerning the possible environmental impact, landscape planning; urban land use, urban design, town-planningscheme, renovation scheme; and execution of planning schemes and control; illegal spatial interventions, permission of spatial interventions.</li> <li>• For students visits to important spatial planning offices and institutes are organized. Data collection and processing for the case of a small settlement is shown as well as an analysis of the situation and/or the existing land use and carrying capacity, conception of new land use and infrastructures (in tutorials).</li> </ul> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Temeljna literatura in viri/Readings:**

Pogačnik, A. 1999. Urbanistično načrtovanje, Ljubljana, UL-FGG.

Pogačnik, A. 2006. Kako izdelamo prostorske načrte, Maribor, Založba Obzorja.

Simoneti, M., Zavodnik Lamovšek, A. 2010. Prostor za vsakdanjo rabo. MOP, Ljubljana.

Zavodnik Lamovšek, A., Simoneti, M. 2015. Gradiva za predmet Prostorsko načrtovanje.

Učno gradivo v spletni učilnici UL FGG.

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

- podati celovito osnovno informacijo o urejanju prostora in varstvu okolja na občinski (lokalni), regionalni in državni ravni,
- spoznati planske dokumente in njihovo izvajanje in
- podrobnejše poznavanje urbanih rab prostora.

**Kompetenci:**

- razumevanje pomena prostora.
- poznavanje postopkov urejanja prostora.

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

- to give the student overall background information about spatial planning and environmental protection at the municipal (local), regional and state levels,
- to get knowledge about planning documents and their implementation and
- to get detailed knowledge about urban land uses.

**Competences:**

- understanding of the importance of space.
- knowledge of spatial planning procedures.

**Predvideni študijski rezultati:**

- Osnovno poznavanje problematike in metod v urejanju prostora kot izhodišče za druga področja znanj iz geodezije in za MA študij prostorskega načrtovanja.
- Poznavanje zakonitosti prostora in procesov v prostoru.
- Razumevanje temeljev trajnostnega razvoja in usklajevanja interesov v prostoru.

**Intended learning outcomes:**

- Basic knowledge of problems and methods in spatial planning as the platform for other fields of knowledge in geodesy and MA studies in Spatial Planning.
- Knowledge of spatial planning regulations and processes.

|  |                                                                                                                                                           |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"> <li>Understanding of the fundamentals of sustainable development and coordination of territorial interests.</li> </ul> |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------|

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

|                                                                   |                                                                           |
|-------------------------------------------------------------------|---------------------------------------------------------------------------|
| Predavanja, vaje, zagovor vaj, sodelovanje na strokovnih obiskih. | Lectures, tutorials, defence of tutorials, participation at study visits. |
|-------------------------------------------------------------------|---------------------------------------------------------------------------|

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

|                                  |         |                                       |
|----------------------------------|---------|---------------------------------------|
| Terensko delo in vaje (udeležba) | 50,00 % | Field work and tutorials (attendance) |
| Pisni izpit                      | 50,00 % | Written exam                          |

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

DROBNE, Samo, ZAVODNIK LAMOVŠEK, Alma, ČEH, Marjan, FERLAN, Miran. Analiza izvajanja veljavnega prostorskega plana Slovenije z vidika obrambe. Geod. vestn.. [Tiskana izd.], 2003, letn. 47, št. 1/2, str. 75-84.

ZAVODNIK LAMOVŠEK, Alma. Vpliv informacijske družbe na razvoj in prenovu mest : primer starega rudarskega mesta Idrija. Dialogi (Maribor), 2010, letn. 46, št. 7/8, str. 136-150, ilustr.

ZAVODNIK LAMOVŠEK, Alma, DROBNE, Samo, ŽAUCER, Tadej. Small and medium-size towns as the basis of polycentric urban development = Majhna in srednje velika mesta kot ogrodje policentričnega urbanega razvoja. Geod. vestn.. [Tiskana izd.], 2008, letn. 52, št. 2, str. 290-312, ilustr. Dostopno na: [http://www.geodetski-vestnik.com/52/2/gv52-2\\_290-312.pdf](http://www.geodetski-vestnik.com/52/2/gv52-2_290-312.pdf).

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                        |
|----------------------|------------------------|
| <b>Predmet:</b>      |                        |
|                      | <b>VIŠJA GEODEZIJA</b> |
| <b>Course title:</b> |                        |
|                      | <b>GEODESY</b>         |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri    |
|----------------------------------------------------------|---------------------------------|-----------|-------------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 2. letnik | 1. semester |

|                                                            |         |
|------------------------------------------------------------|---------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 0033801 |
| <b>Koda učne enote na članici/UL Member course code:</b>   | 1176    |

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

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

|                                    |                                            |
|------------------------------------|--------------------------------------------|
| <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 Matematika I, Matematika II, Fizika.            | Passed exams in Mathematics I, Mathematics II, Physics. |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                              |
| <ul style="list-style-type: none"> <li>Osnovni pojmi o obliki in velikosti Zemlje.</li> <li>Osnovni pojmi, parametri in zveze med parametri rotacijskega elipsoida.</li> <li>Definicija poldnevnik, I. vertikal in vzporednik elipsoida.</li> <li>Definicija geodetskih in astronomskih koordinat.</li> <li>Povezava pravokotnih in geodetskih koordinat na rotacijskem elipsoidu.</li> <li>Polmeri ukrivljenosti poldnevnik, I. vertikal in vzporednik ter srednji polmer ukrivljenosti rotacijskega elipsoida v točki.</li> </ul> | <ul style="list-style-type: none"> <li>Basics about shape and size of the Earth.</li> <li>Basic concepts, parameters and relations between the ellipsoid of revolution parameters.</li> <li>Definition of meridian, prime vertical and parallel of ellipsoid of revolution.</li> <li>Definition of geodetic and astronomic coordinates.</li> <li>Relations between geodetic and Cartesian coordinates on an ellipsoid of revolution.</li> </ul> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Normalni preseki elipsoida in ravnine, dvojnost normalnih presekov, azimut normalnega preseka.</li> <li>• Geodetska krivulja kot najkrajša oddaljenost točk na ploskvi.</li> <li>• Dolžina loka poldnevnika rotacijskega elipsoida.</li> <li>• Gauss-Kruegerjeva projekcija, prečna Mercatorjeva projekcija, izračun koordinat v projekcijski ravnini, izračun koordinat na elipsoidu, deformacija merila in modulacija projekcije, meridijanska konvergenca.</li> <li>• Sila teže, centrifugalna sila, sila teže, pospešek sile teže, polje pospeška sile teže, potencial pospeška sile teže.</li> <li>• Višinski sistemi v geodeziji</li> <li>• Metode transformacij koordinatnih sistemov v geodeziji, matematični model podobnostne transformacije v 2- in 3- razsežnem prostoru.</li> <li>• Rotacijske in refleksijske matrike: lastnosti in uporaba.</li> </ul> | <ul style="list-style-type: none"> <li>• The radii of curvature of meridian, prime vertical and parallel, and mean radius of curvature of the ellipsoid of revolution in a chosen point.</li> <li>• Normal sections of ellipsoid and plane, duality of normal cross-sections, the azimuth of the normal cross-section.</li> <li>• Geodesic as the curve of shortest length at ellipsoid of revolution.</li> <li>• The length of the meridian arc at the ellipsoid of revolution.</li> <li>• Gauss-Krueger projection, Transverse Mercator projection, computation of projection coordinates, computation of ellipsoidal coordinates, scale deformation, modulated projection, meridian convergence.</li> <li>• Gravitational force, centrifugal force, gravity force, gravity, gravity field, gravity potential.</li> <li>• Height systems in geodesy.</li> <li>• Methods of transformations of coordinate systems in geodesy, mathematical model of similarity transformations in 2-and 3-dimensional space.</li> <li>• Rotation and reflection matrices: properties and applications.</li> </ul> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Temeljna literatura in viri/Readings:**

Schwarz, K.P. 1996. Fundamentals of Geodesy, skripta z University of Calgary, Faculty of Geomatics Engineering, Kanada. Spletna učilnica UL FGG

Stopar, B. 2014. Višja geodezija, skripta v nastajanju. Učno gradivo v spletni učilnici UL FGG.

Torge, W. 2001. Geodesy 2. izdaja. New York, Walter de Gruyter.

Vaníček, P., Krakiwsky, E. 1986. Geodesy: The Concept, 2. izdaja. Amsterdam, Elsevier.

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

- seznanitev z osnovnimi geometrijskimi lastnostmi Zemlje kot nebesnega telesa,
- poznavanje lastnosti geometrije rotacijskega elipsoida,
- poznavanje osnovnih krivulj na rotacijskem elipsoidu in njihovih lastnosti: poldnevnik, vzporednik, prvi vertikal, geodetska krivulja,
- poznavanje različnih vrst koordinat za opis lege na Zemlji, krogli in rotacijskem elipsoidu,
- poznavanje preslikave koordinat s površine rotacijskega elipsoida v ravnino Gauss-Kruegerjeve/prečne Mercatorjeve projekcije,
- poznavanje osnovnih geometrijskih lastnosti težnostnega polja Zemlje in sistemov višin v geodeziji,
- poznavanje osnovnih koordinatnih sistemov v geodeziji in osnovnih transformacij med njimi.

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

- understanding of basic geometric properties of the Earth as a planet,
- knowledge of the geometrical properties of an ellipsoid of revolution,
- knowledge of basic curves on an ellipsoid of revolution: meridian, parallel, prime vertical, geodesic curve and their properties and
- knowledge of the different types of coordinates to describe the position on the Earth, on a sphere and on an ellipsoid of revolution,
- knowledge of projection of ellipsoidal coordinates to the Gauss-Krueger/Transverse Mercator projection plane,
- knowledge of basic geometric properties of Earth's gravity field and height systems in geodesy,

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><b>Kompetence:</b></p> <ul style="list-style-type: none"> <li>• razumevanje osnovnih geometrijskih lastnosti Zemlje kot planeta in razumevanje različnih vrst koordinat za opis lege točke na Zemlji, krogli, rotacijskem elipsoidu,</li> <li>• poznavanje geometrijskih lastnosti rotacijskega elipsoida; poznavanje osnovnih krivulj na rotacijskem elipsoidu: poldnevnik, vzporednik, l. vertikal, geodetske krivulje in njihovih lastnosti,</li> <li>• razumevanje preslikave med rotacijskim elipsoidom in plaščem valja v okviru prečne valjne kartografske projekcije,</li> <li>• razumevanje postopkov za redukcijo opazovanj z rotacijskega elipsoida na ravnino kartografske projekcije,</li> <li>• poznavanje osnovnih lastnosti težnostnega polja Zemlje in višinskih sistemov v geodeziji,</li> <li>• poznavanje postopkov transformacij koordinatnih sistemov v geodeziji.</li> </ul> | <ul style="list-style-type: none"> <li>• knowledge of basic coordinate systems in geodesy and basic transformations between coordinate systems in geodesy.</li> </ul> <p><b>Competences:</b></p> <ul style="list-style-type: none"> <li>• understanding basic geometric properties of the figure of the Earth and understanding different types of coordinates on the Earth, sphere and ellipsoid of revolution,</li> <li>• understanding geometric properties of ellipsoid of revolution, knowledge of basic curves on ellipsoid of revolution; meridian, parallel, prime vertical, geodesic and their properties,</li> <li>• understanding the basic principle of mapping of the ellipsoid of revolution surface according to transverse cylindrical map projection,</li> <li>• understanding the procedures for the reduction of observations from an ellipsoid of revolution and onto a map projection plane,</li> <li>• understanding basic properties of Earth's gravity field and height systems in geodesy,</li> <li>• understanding of the principles and procedures of transformation of coordinate systems in geodesy.</li> </ul> |
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**Predvideni študijski rezultati:**

- Znanje in razumevanje osnovnih pojmov, zakonitosti in postopkov višje geodezije.
- Pridobitev teoretičnih znanj, potrebnih za praktično delo na področju višje geodezije.
- Razumevanje globalnega obravnavanja Zemlje, njenih geometrijskih lastnosti in težnostnega polja Zemlje.
- Razumevanje in razlikovanje med astronomskimi in geodetskimi koordinatami točke na Zemlji.
- Razumevanje preslikave površja Zemlje na površino rotacijskega elipsoida.
- Razumevanje vpliva težnostnega polja Zemlje na lego in koordinate na Zemlji.
- Razumevanje potrebnosti upoštevanja geometrije težnostnega polja Zemlje in njegovega vpliva na osnovna opazovanja v geodeziji.
- Pridobitev znanj za inženirsko reševanje enostavnih strokovnih problemov v praksi na področju višje geodezije.

**Intended learning outcomes:**

- Knowledge and understanding of basic concepts, rules and procedures of geodesy.
- Acquisition of theoretical knowledge required for practical work in the field of geodesy.
- Understanding the global treatment of the Earth, its geometric properties and gravity field.
- Understanding and distinguishing between astronomical and geodetic coordinates on the Earth.
- Understanding the mapping of the surface of the Earth to the surface of an ellipsoid of revolution.
- Understanding the impact of the Earth's gravity to the position and coordinates on the Earth.
- Understanding the need of considering the geometry of the Earth's gravity field and its impact on the basic observations in geodesy.
- Acquisition of knowledge to solve basic engineering problems in professional practice in the field of geodesy.

**Metode poučevanja in učenja:**

Predavanja, seminarske in laboratorijske vaje (računalniška učilnica).

**Learning and teaching methods:**

Lectures, tutorials and laboratory work (computer room).

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

|                                        |         |                                                     |
|----------------------------------------|---------|-----------------------------------------------------|
| Pisni izpit (teoretičen del)           | 50,00 % | Written examination (theoretical part).             |
| Ustni zagovor izdelanih elaboratov vaj | 50,00 % | Oral presentation of practical exercises elaborates |

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

PAVLOVČIČ PREŠEREN, Polona, STOPAR, Bojan. Wavelet Neural Network employmnet for continuous GNSS orbit function construction: Application for the Assisted - GNSS principle. Applied soft computing, 2013, letn. 13, št. 5, str. 2526-2536, ilustr., doi: 10.1016/j.asoc.2012.11.034.

STOPAR, Bojan, AMBROŽIČ, Tomaž, KUCHAR, Miran, TURK, Goran. GPS - derived Geoid Using Artificial Neural Network and Least Squares Collocation. Surv. rev., 2006, vol. 38, no. 300, str. 513-524, graf. prikazi.

WEBER, John, VRABEC, Marko, PAVLOVČIČ PREŠEREN, Polona, DIXON, Tim, JIANG, Yan, STOPAR, Bojan. GPS-derived motion of the Adriatic microplate from Istria Peninsula and Po Plain sites and geodynamic implications. Tectonophysics (Amst.). [Print ed.], mar. 2010, vol. 483, iss. 3-4, str. 214-222, ilustr., doi: 10.1016/j.tecto.2009.09.001.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                     |
|----------------------|---------------------|
| <b>Predmet:</b>      |                     |
|                      | <b>KARTOGRAFIJA</b> |
| <b>Course title:</b> |                     |
|                      | <b>CARTOGRAPHY</b>  |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 2. letnik | Zimski   |

Univerzitetna koda predmeta/University course code:

1177

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

Nosilec predmeta/Lecturer:

Dušan Petrovič

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):

Predavanja:

- definicija in pomen kartografije,
- kartografska komunikacija, karta in njene lastnosti, kartam sorodni prikazi,
- zgodovina kartografije v svetu in v Sloveniji. Razvoj tehnologije kartografije,
- nacionalna in evropska prostorska podatkovna infrastruktura, državni topografsko kartografski sistem, državne karte in baze topografskih podatkov, drugi razpoložljivi topografski podatki
- matematična kartografija, koordinatni sistemi v kartografiji, rotacijski elipsoidi, kartografska

Lectures:

- definition and meaning of cartography,
- cartographic communication, map and its attributes, map related presentations,
- history of cartography in general and in Slovenia, development of cartographic technology,
- national and European spatial database infrastructure, national topographic cartographic system, national maps and topographic databases, other available topographic data

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| <p>projekcija, konformnost, ekvivalentnost in ekvidistančnost,</p> <ul style="list-style-type: none"> <li>• ploskev preslikave in tipi projekcij, Gauss-Kruegerjeva projekcija in sistem D48, sdistem UTM, državni koordinatni sistem, sistem D96/ETRS,</li> <li>• sistemske karte, razdelitve na liste,</li> <li>• uporaba kart, kartometrija, interpretacija vsebine,</li> <li>• profili terena, pripomočki in orientacija na terenu,</li> <li>• uporaba kart na zaslonu, lokacijske storitve,</li> <li>• kartografska redakcija, projekt izdelave karte, redakcijska dela, redakcijski načrt, kakovost kart in zagotavljanje kakovosti,</li> <li>• vsebina kart, objektni katalog, kartografski viri,</li> <li>• kartografsko oblikovanje, grafični elementi in spremenljivke, barve, kreiranje in uporaba kartografskih znakov, oblikovanje znakovkart za različne medije,</li> <li>• metode prikaza na kartah, kartografska generalizacija, pomen, postopki in metode, avtomatizacija postopkov,</li> <li>• načini zapisa prostorskih informacij, modeliranje stvarnosti, urejanje podatkov.</li> <li>• topologija, topografske in kartografske base, kartografski viri, kakovost virov,</li> <li>• kartografska redakcija; projekt izdelave karte; redakcijska dela; redakcijski načrt,</li> <li>• tehnologija izdelave kart, razvoj tehnologije kartografije, mediji karte, programska oprema in orodja, avtomatizacija postopkov,</li> <li>• načini zapisa prostorskih informacij, modeliranje stvarnosti, urejanje podatkov, topologija,</li> <li>• internetna izdelava kart, programska oprema in orodja, odprtakodni, razmnoževanje kart, tisk.,</li> <li>• uporaba kart, kartometrija, interpretacija vsebine,</li> <li>• profili terena, pripomočki in orientacija na terenu,</li> <li>• uporaba kart na zaslonu</li> <li>• lokacijske storitve.</li> </ul> <p><b>Vaje:</b></p> <ul style="list-style-type: none"> <li>• prepoznavanje kart,</li> <li>• ogled starih kart,</li> <li>• vaje iz matematične kartografije, kartometrija,</li> <li>• terenska vaja orientacije in</li> <li>• izdelava projekta karte.</li> </ul> | <ul style="list-style-type: none"> <li>• mathematic cartography, coordinate systems in cartography, rotation ellipsoids, map projections, conformal, equivalent and equidistant projections, projection types,</li> <li>• Gauss-Krueger projection, system UTM, ETRS/D96, national coordinate system,</li> <li>• systemic maps, map sheets,</li> <li>• map use, map measuring, map interpretation,</li> <li>• terrain profile, navigation and orientation, instruments and adds,</li> <li>• use of screen maps, location based services.</li> <li>• editing of maps, project of map production, editorial works, editorial plan, map quality and quality assurance,</li> <li>• map content, object catalogue, cartographic source data,</li> <li>• cartographic design, graphic elements and variables, colors, creation and implementation of map symbols,</li> <li>• map design for different media, cartographic generalisation, meaning, methods and procedures, automation of procedures, recording of spatial information, modelling of reality, data editing, topology, topographic and cartographic bases, cartographic sources, quality of sources, national and European spatial database infrastructure, legislation, standardization, national topographic cartographic system, national maps and topographic databases, editing of maps, project of map production, editorial works, editorial plan,</li> <li>• technology of map production, development of cartographic technology, map media, automation of procedures, software and hardware for map production, recording of spatial information, modelling of reality, data editing, tools, creation of maps on internet, software and hardware for map production, topology,</li> <li>• map reproduction, printing.</li> </ul> <p><b>Practical work:</b></p> <ul style="list-style-type: none"> <li>• map recognition,</li> <li>• old maps,</li> <li>• practice from mathematical cartography,</li> <li>• terrain work – orientation and navigation and</li> <li>• map creation project.</li> </ul> |
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### Temeljna literatura in viri/Readings:

Field, K. 2018. Cartography. Esri Press.

Kimerling, A.J., Buckley, A.R., Muehrcke, P.C. and Muehrcke, J.O. 2016. Map Use, Esri Press.

Kraak, M. J. and Ormeling, F. J. 2011. Cartography visualization of spatial data. New York, Guildford Press.

Krygier, J. and Wood, D. 2005. Making Maps: A Visual Guide to Map Design for GIS. New York, Guildford Press.

Petrovič, D. 20185. Gradiva za predmet Kartografija. Učno gradivo v spletni učilnici UL FGG.

Robinson, A. H., Morrison, J. L., Muehrcke, P. C., Kimerling, A. J. and Gupitill, S. C. 1995. Elements of Cartography. Wiley.

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

- študenti spoznajo osnovna načela kartografije kot znanosti,
- spoznajo njen pomen pri predstavljanju in zapisovanju podatkov o prostoru ter komunikacijski vrednosti prenosa posredovanja prostorskih podatkov,
- seznanijo se s postopki izdelave kart in z njihovo uporabo,
- spoznajo sodobne načina zapisa prostorskih informacij in se seznanijo z razpoložljivimi uradnimi kartami in topografskimi podatki v Sloveniji, Evropi in svetu.

**Kompetence:**

- poznavanje in razumevanje kartografije in kart,
- sposobnost izdelave različnih kartografskih prikazov z različnimi postopki in
- usposobljenost prepoznavanja razpoložljivih virov topografskih podatkov.

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

- getting familiar with basic principles of cartography as a science and its meaning for visualizing and recording spatial data as well as the communication value of spatial data transfer,
- students get used to map creation procedures and their use, map use, contemporary methods of spatial data recording and
- get familiar with present official maps and topographic databases in Slovenia, Europe and in the world.

**Competences:**

- understanding the importance and meaning of cartography and maps,
- capability of creating different types of maps using different procedures,
- ability to select appropriate map data sources.

**Predvideni študijski rezultati:**

- Znanje in razumevanje osnovnih strokovnih pojmov, zakonitosti in postopkov, pomembnih značilnosti, ki ločijo kartografijo kot samostojno znanost.
- Sposobnost uporabe kart, njihovega razumevanja.
- Sposobnost izdelave manj zahtevnih kart.
- Na osnovi teoretičnega znanja in praktično pridobljenih izkušenj sposobnost kritična presoja ustreznosti in primernosti kartografskih izdelkov in drugih podatkov o prostoru, s katerimi se vsakodnevno srečujemo in možnost njihove najustreznejše uporabe.
- Študenti se navajajo na povezovanje izredno širokega spektra s kartografijo povezljivih naravoslovnih, družboslovnih in tehničnih znanosti, ki so potrebne za sintezno razumevanje kartografije.

**Intended learning outcomes:**

- Knowledge and understanding of basic professional terms, knowledge and procedures that define cartography as a scientific discipline.
- Capability of using maps, their understanding.
- Creating different types of less complex maps.
- Based on theoretical knowledge and practical experiences competence for critical evaluation of map products, which we daily meet and use; the best possible way of use.
- Students get familiar with wide aspect of different disciplines connected with cartography: natural, social or technical, which are important for synthetic understanding of cartography.

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

Predavanja: v predavalnici, uporaba sodobnih metod poučevanja (grafične ponazoritve, demonstracije, primeri iz prakse).

Praktične vaje: izvedba v računalniški učilnicipredavalnici, problemsko reševanje, terenska vaja, ogledi in obiski, posamična izvedba projekta izdelave karte v računalniški učilnici v majhnih skupinah pod vodstvom in ob usmerjanju pedagoga.

Lectures in classroom with modern IT equipment (graphical presentations, demonstration, practical cases).

Practical work: in computer classroom, problem solving, terrain exercise, site visits, individual map creation in computer classroom in small groups under supervision of lecturer.

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

|                                           |         |                    |
|-------------------------------------------|---------|--------------------|
| Teoretični izpit (ustni ali s kolokvijem) | 50,00 % | Theoretical exam   |
| Projektna (seminarska) naloga             | 15,00 % | Project (seminar)  |
| Praktični preizkus                        | 15,00 % | Practical exam     |
| Terenska vaja                             | 5,00 %  | Terrain exercise   |
| Sprotno delo pri vajah                    | 15,00 % | Regular activities |

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

PETROVIČ, Dušan. Quality evaluation of the national topographic map 1 : 50 000 = Ocena kakovosti državne topografske karte v merilu 1 : 50 000. Geod. vestn.. [Tiskana izd.], 2006, letn. 50, št. 3, str. 425-438

PETROVIČ, Dušan. Trirazsežne (tematske) karte v prostorskem načrtovanju = Three-dimensional (thematic) maps in spatial planning. Geod. vestn.. [Tiskana izd.], 2007, št. 2, letn. 51, str. 293- 303.

ŠAVRIČ, Bojan, JENNY, Bernhard, PATTERSON, Tom, PETROVIČ, Dušan, HURNI, Lorenz. A Polynomial Equation for the Natural Earth Projection. Cartography and geographic information science. [Tiskana izd.], okt. 2011, letn. 38, št. 4, str. 363-372

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                         |
|----------------------|-------------------------|
| <b>Predmet:</b>      |                         |
|                      | <b>GEOINFORMATIKA I</b> |
| <b>Course title:</b> |                         |
|                      | <b>GEOINFORMATION I</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 2. letnik | Zimski   |

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|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1649 |
|------------------------------------------------------------|------|

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

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

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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> |
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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Predavanja:</b> <ul style="list-style-type: none"> <li>izrazoslovje in literatura, pomen prostorskih (geografskih) podatkov in vloga informacij stvarnem prostoru pri odločanju;</li> <li>sistem, informacijski sistem (IS) in prostorski informacijski sistemi (PIS/GIS in LIS);</li> <li>geoinformatika in tehnologija GIS, sestavine, zgodovina in razvoj;</li> <li>razvojni modeli IS, sistemsko inženirstvo, strateško planiranje razvoja, UML in geoinformatika;</li> <li>modeliranje in podatkovni modeli, koncept stvarnega prostora in časa ter njuna abstrakcija,</li> </ul> | <b>Lectures:</b> <ul style="list-style-type: none"> <li>Overview of the subject content (introduction, purpose, terminology, literature, etc.), spatial data structure, graphical and descriptive attributes, acquisition techniques,</li> <li>system, information system and GIS,</li> <li>geoinformation and GIS technology, history and development,</li> <li>modeling of reality, UML and conceptual modeling of problem domain</li> <li>analog and digital spatial data, sources and acquisition techniques, realization of models and data in relational DBMS,</li> </ul> |

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| <p>modeliranje izbranega dela stvarnosti (kartografsko in objektno usmerjeno) v bazah podatkov;</p> <ul style="list-style-type: none"> <li>analogni in digitalni prostorski podatki - viri in značilnosti, vektorske, rastrske grafične baze podatkov, značilnosti časovnih podatkov;</li> <li>mednarodna, regionalna in nacionalna standardizacija in vrste standardov, industrijska standardizacija, de facto standardi;</li> <li>pomen formalnih in odprtih standardov za področje geoinformatike in pregled standardov za prostorske podatke - ISO/TC 211 in OGC, primeri standardnega metapodatkovnega opisa;</li> <li>tehnologija OpenGIS in odprti standardi OGC - spletni servisi OGC, standardi za prenos prostorskih podatkov in GML (Geography Markup Language);</li> <li>objektni katalogi in standardizacija;</li> <li>prostorska informacijska infrastruktura, pomen in vloga, nacionalne in evropske pobude (INSPIRE).</li> </ul> <p><b>Vaje:</b></p> <ul style="list-style-type: none"> <li>Na izbranem območju obravnave prikazati načine in tehnike od pridobivanja prostorskih podatkov, urejanja, do ustrezne analize podatkov in upodobitve rezultatov ter njihove interpretacije, hkrati pa doseči razumevanje posameznih teoretičnih sklopov in nadalje obravnavanih procesov v prostoru.</li> </ul> | <ul style="list-style-type: none"> <li>standardization and types of standards in the geoinformation domain, formal, de facto and open industrial standards,</li> <li>overview of formal and industrial standardization in the geoinformation domain, ISO/TC 211 and OGC, description of some important formal and open source standards for geographical data,</li> <li>feature catalogues, standardization classification schemas and its application,</li> <li>SDI and its EU implementation (INSPIRE).</li> </ul> <p><b>Tutorials:</b></p> <ul style="list-style-type: none"> <li>Analysis of different spatial data sets for various territories and value domains. Understanding of spatial data modeling and analysis process, its theoretical methodology and its practical applications in the problem solving approach. Monitoring of spatial processes and decision making based on available spatial data and information.</li> </ul> |
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**Temeljna literatura in viri/Readings:**

Heywood Ian, Cornelius Sarah and Carver Steve, 2011. Introduction to GIS, Prentice Hall.

Šumrada Radoš, 2005. Tehnologija GIS. Ljubljana, Univerza v Ljubljani – Fakulteta za gradbeništvo in geodezijo. 500 str. ISBN 961-6167-77-4.

Zeiler Michael, 2010, Modeling Our World: The Esri Guide to Geodatabase Concepts, Esri press, 2nd. ed.

Wilpen L. Gorr, Kristen S. Kurland. (2013). GIS Tutorial 1: Basic Workbook10.1 Edition. Esri Press, 4th ed.

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

- razumevaje kompleksnosti obravnavanja modelov prostora in prostorskih podatkov,
- spoznati osnove geoinformatike in tehnik za zajemanje, obdelave, urejanje, analize in upodobitev prostorskih podatkov

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

- understanding of space and time, modeling of concepts of reality in digital systems, spatial data as facts about reality, the importance of data quality and reliability.
- gaining the basic knowledge and importance of geoinformation, data acquisition, gathering, storing, distribution, visualization and value of spatial data, spatial data and spatial information in a decision making process.

**Predvideni študijski rezultati:**

- Seznanitev s strokovno terminologijo, osnove razumevanja geoinformatike in povezava z geodetsko stroko.
- Poglobljeno razumevanje koncepta stvarni prostor in čas, pojmovnega modeliranja izbranega dela stvarnosti, prostorskih podatkov, njihove sestave in značilnosti.
- Razumevanje sestave geoinformatike v sklopu informatike, pomena kvalitetnih prostorskih informacij, standardizacije področja in izvedba aplikativnih primerov uporabe.

**Intended learning outcomes:**

- Overview and gained knowledge of ontology in the geoinformation domain and its relation with the surveying and geodetic field.
- The understanding of the concepts of reality, its models in spatial sciences and engineering approaches, the influence of changes due to time flow and spatial activities.
- The importance spatial data quality and the complex correlation of its elements to geoinformation and the importance of standardization in the field of geoinformation.

**Metode poučevanja in učenja:**

Predavanja in vaje (računalniška učilnica)

**Learning and teaching methods:**

Lectures and tutorials (computer room)

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

|                              |         |                                 |
|------------------------------|---------|---------------------------------|
| Naloge in sprotno delo       | 20,00 % | Exercises and practical tasks   |
| Pisni izpit (teoretičen del) | 60,00 % | Written exam (theoretical part) |
| Projekt (seminarska naloga)  | 20,00 % | Project work                    |

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

DROBNE, Samo, LISEC, Anka. Multi-attribute Decision Analysis in GIS: Weighted Linear Combination and Ordered Weighted Averaging. Informatica, 2009, letn. 33, št. 4, str. 459-474, ilustr.

LISEC, Anka, FERLAN, Miran, LOBNIK, Franc, ŠUMRADA, Radoš. Modelling the rural land transaction procedure. Land use policy, 2008, letn. 25, št. 2, str. 286-297, dx.doi.org/10.1016/j.landusepol.2007.08.003.

ŠMID HRIBAR, Mateja, LISEC, Anka. Protecting trees through an inventory and typology: heritage trees in the Karavanke mountains, Slovenia = Vloga inventarizacije in tipizacije pri učinkovitem varovanju drevesne dediščine v pokrajini: drevesna dediščina v Karavankah. Acta geographica Slovenica, 2011, 51, št. 1, str. 169-188, doi: 10.3986/AGS51108. [COBISS.SI-ID 33475629].

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                        |
|----------------------|----------------------------------------|
| <b>Predmet:</b>      |                                        |
|                      | <b>OSNOVE OBDELAVE PODATKOV</b>        |
| <b>Course title:</b> |                                        |
|                      | <b>INTRODUCTION TO DATA PROCESSING</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 2. letnik | Zimski   |

Univerzitetna koda predmeta/University course code:

1734

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

Nosilec predmeta/Lecturer:

Krištof Oštir, Matevž Dolenc

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:

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Vsebina:

Content (Syllabus outline):

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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| <b>Predavanja:</b> <ul style="list-style-type: none"> <li>pregled vsebine predmeta, izrazoslovje in izbrana literatura,</li> <li>uvod v programiranje,</li> <li>metodologije razvoja programske opreme,</li> <li>programski jezik Python (osnove, matematične knjižnice, risanje grafov),</li> <li>osnove baz podatkov, sodobna razširjena relacijska tehnologija, značilnosti in uporaba standardnega jezika SQL,</li> <li>standardni zapisi podatkov (tekstovne datoteke, XML, JSON),</li> <li>interaktivni dokumenti Jupyter,</li> </ul> | <b>Lectures:</b> <ul style="list-style-type: none"> <li>overview of course content, terminology and literature,</li> <li>introduction to programming,</li> <li>software development methodology,</li> <li>programming language Python (introduction, mathematical libraries, graphing),</li> <li>basics of databases, relational technology, characteristics and use of the standard SQL language,</li> <li>standard data formats (text files, XML, JSON),</li> <li>Jupyter interactive documents</li> </ul> |
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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>analiza podatkov s knjižnicami pandas, matplotlib in numpy,</li> <li>sodobni informacijski sistemi, računska okolja (visoko-zmogljiva in visoko-prepustna).</li> </ul> <p><b>Vaje:</b></p> <ul style="list-style-type: none"> <li>izdelava enostavnih programov (prenos podatkov, branje, pretvorba, izris, analiza),</li> <li>uvod v analizo podatkov s QGISom in Pythonom in</li> <li>izdelava projektne naloge.</li> </ul> | <ul style="list-style-type: none"> <li>data analysis with pandas, matplotlib and numpy,</li> <li>modern information systems, computing environment (high-performance and high-permeable).</li> </ul> <p><b>Exercises:</b></p> <ul style="list-style-type: none"> <li>creating simple programs (data transfer, reading, converting, plotting, analysis),</li> <li>introduction to data analysis with QGIS and Python and</li> <li>project work preparation.</li> </ul> |
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**Temeljna literatura in viri/Readings:**

Prosojnice predavanj, navodila za vaje.

Lutz, M. 2013. Learning Python, O'Reilly Media.

Mueller, John. Beginning Programming with Python for Dummies. John Wiley & Sons, 2014.

Python Software Foundation. 2014. Python Documentation. <https://docs.python.org/3/>

Stellman, A., Greene, J. 2015. Learning Agile, O'reilly Media.

**Cilji in kompetence:**

- Spoznati osnove programiranja, programskih orodij in metodologij razvoja programske opreme.
- Spoznati programski jezik Python.
- Spoznati osnovne standardizirane zapise podatkov (tekstovne datoteke, XML, JSON).
- Naučiti se relacijskih baz podatkov (uporaba, načrtovanje, programiranje in PostgreSQL).
- Pridobiti razumevanje osnov varne komunikacije.
- Izdelati preprost računalniški program.
- Razumeti zahteve interoperabilnih programskih rešitev.
- Biti sposoben rešiti inženirske naloge s povezavo različnih programskih orodij (Python, QGIS, ArcGIS, Excel).

**Objectives and competences:**

- Learn the basics of programming, programming tools and methodologies of software development.
- Learning programming in Python.
- Learn basic standard data files (text files, XML, JSON).
- Learn relational databases (use, planning, programming in PostgreSQL).
- Obtain an understanding of the basics of secure communications.
- Produce a simple computer program.
- Understand the requirements of interoperable software solutions.
- Being able to solve engineering tasks of the various software tools (Python QGIS, ArcGIS, Excel).

**Predvideni študijski rezultati:**

- Samostojna izdelava enostavnih inženirskih programov.
- Vizualizacija podatkov – uporaba različnih programov za izdelavo grafikonov, kart ...
- Razumevanje osnovnih principov varne komunikacije.
- Uporaba in programiranje sodobnih relacijskih baz podatkov.

**Intended learning outcomes:**

- Development of basic engineering applications.
- Data visualization – use of different applications for producing charts, maps, ...
- Understanding of essential principles of secure communication.
- Use and programming of modern relational databases.

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

|                                                                                                                                 |                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Predavanja potekajo v predavalnici, uporaba sodobnih metod poučevanja (grafične ponazoritve, demonstracije, primeri iz prakse). | Lectures in classroom with modern IT equipment (graphical presentations, demonstration, practical cases). |
| Laboratorijske vaje po podanih gradivih in samostojna projektna naloga.                                                         | Guided and prepared exercises in computer lab and individual project.                                     |

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

|                         |         |                                    |
|-------------------------|---------|------------------------------------|
| Izpit (praviloma pisni) | 50,00 % | Final exam (normally written part) |
| Projektna naloga        | 50,00 % | Project work                       |

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

ĐURIĆ, Nataša, PEHANI, Peter, **OŠTIR, Krištof**. Application of in-segment multiple sampling in object-based classification. Remote sensing, ISSN 2072-4292. [Online ed.], Dec. 2014, vol. 6, iss. 12, str. 12138-12165, ilustr. <http://www.mdpi.com/2072-4292/6/12/12138>, doi: 10.3390/rs61212138.

MARSETIČ, Aleš, **OŠTIR, Krištof**, KOSMATIN FRAS, Mojca. Automatic orthorectification of high-resolution optical satellite images using vector roads. IEEE transactions on geoscience and remote sensing, ISSN 0196-2892. [Print ed.], 2015, vol. 53, iss. 11, str. 6035-6047, doi: 10.1109/TGRS.2015.2431434.

PEHANI, Peter, ČOTAR, Klemen, MARSETIČ, Aleš, ZALETELJ, Janez, **OŠTIR, Krištof**. Automatic geometric processing for very high resolution optical satellite data based on vector roads and orthophotos. Remote sensing, ISSN 2072-4292. [Online ed.], 2016, vol. 8, iss. 4, ilustr. <http://www.mdpi.com/2072-4292/8/4/343>, doi: 10.3390/rs8040343.

**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. [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. [www.itcon.org/2009/31](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.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                         |
|----------------------|-------------------------|
| <b>Predmet:</b>      |                         |
|                      | <b>FOTOGRAMETRIJA I</b> |
| <b>Course title:</b> |                         |
|                      | <b>PHOTOGRAMMETRY I</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 2. letnik | Zimski   |

Univerzitetna koda predmeta/University course code:

1648

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

Nosilec predmeta/Lecturer:

Dejan Grigillo

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):

- Definicije in osnovna terminologija, zgodovinski razvoj,
- osnove fotografije,
- delovanje in značilnosti slikovnih senzorjev,
- osnove delovanja letalskih snemalnih sistemov,
- slikovni koordinatni sistem, kalibracijsko poročilo fotoaparata, notranja orientacija,
- korekcije slikovnih koordinat,
- ravninske transformacije,
- osnove slikovnega ujemanja,
- postopek izračuna parametrov zunanje orientacije posnetka in stereopara,
- osnove projekta aerotriangulacije,

- Definitions and basic terminology, historical development,
- basics of photography,
- working principles and characteristics of image sensors,
- basic working principles of aerial imaging systems,
- image coordinate system, camera calibration report, inner orientation,
- image coordinates corrections,
- planar transformations,
- basics of image matching,

|                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• letalsko snemanje v Sloveniji,</li> <li>• metode in natančnost zajema vektorskih podatkov,</li> <li>• osnovna načela fotogrametričnega zajema podatkov,</li> <li>• izdelava ortofota,</li> <li>• državni topografski podatki in projekti - pregled.</li> </ul> | <ul style="list-style-type: none"> <li>• steps of computing parameters of exterior orientation,</li> <li>• basics of aerial triangulation project,</li> <li>• aerial survey in Slovenia,</li> <li>• methods and accuracy of vector data acquisition,</li> <li>• basic principles of photogrammetric collection of data,</li> <li>• orthophoto production,</li> <li>• national topographic data and projects – a review.</li> </ul> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Temeljna literatura in viri/Readings:**

Graham, R. 2005. The Digital Image. Whittles Publishing, izbrana poglavja.

Kosmatin-Fras M., Grigillo, D. 2014. Gradiva za predmet Fotogrametrija I. Učno gradivo v spletni učilnici UL FGG.

Kraus K. Photogrammetry, Geometry from Images and Laser Scans. Walter de Gruyter, Berlin-New York, 2007 (ali starejše izdaje 1. zvezka); izbrana poglavja.

Mikhail, E.M. et al 2001. Introduction to Modern Photogrammetry. John Wiley & Sons, izbrana poglavja.

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

- študenti spoznajo osnovne principe obdelave fotogrametričnih podatkov, ki so potrebni za izvajanje enostavnih fotogrametričnih projektov.

**Kompetence:**

- poznavanje fizikalnih in matematičnih osnov fotogrametričnih postopkov,
- orientacija posnetka in stereopara,
- osnove fotogrametričnega zajema podatkov, izdelava in
- uporaba ortofota.

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

- students learn the basic principles of photogrammetric data processing which are needed for accomplishing simple photogrammetric projects.

**Competences:**

- understanding physical and mathematical basics of photogrammetric procedures,
- orientation of an image and a stereo pair,
- basics of photogrammetric data acquisition,
- production and use of orthophoto,

**Predvideni študijski rezultati:**

- Znanje in razumevanje osnov fotogrametričnih procesov s poudarkom na matematičnih in fizikalnih zakonitostih fotogrametričnih podob, zgradbi in uporabi inštrumentarija, osnovnih tehnikah orientacije posnetkov in zajemu podatkov na digitalni fotogrametrični postaji.
- Študenti se naučijo uporabljati teorijo v praksi, sposobni so analizirati in interpretirati dobljene rezultate.
- Študenti se navajajo na samostojno delo (iskanje in uporaba različnih virov) in tekoče spremljanje področja.
- Povezujejo in uporabljajo znanje, ki ga pridobijo pri drugih predmetih.

**Intended learning outcomes:**

- Knowledge and understanding of basic photogrammetric processes with the emphasis on mathematical and physical facts of photogrammetric images, construction and use of equipment, basic techniques of image orientation and data acquisition on digital photogrammetric workstation.
- Students learn to use the theory in practice, they are able to analyze and interpret the obtained results.
- Students are accustomed to independent work (search and use of different sources) and continuous following of the professional novelties.

|  |                                                                                                                  |
|--|------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"> <li>• They combine and use knowledge gained also in other courses.</li> </ul> |
|--|------------------------------------------------------------------------------------------------------------------|

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

|                                                                                                                                                                              |                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Predavanja: prosojnice, grafične ponazoritve, demonstracije, primeri iz prakse.<br><br>Praktične vaje: računalniška učilnica, uporaba specializirane fotogrametrične opreme. | Lectures: slides, graphical presentations, demonstrations, practical examples.<br><br>Practical exercises: computer classroom, use of specialized photogrammetric equipment. |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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

|                              |         |                               |
|------------------------------|---------|-------------------------------|
| Projekt (seminarska naloga)  | 10,00 % | Project (seminar work)        |
| Naloge in sprotno delo       | 50,00 % | Exercises and on-going work   |
| Pisni izpit (teoretičen del) | 40,00 % | Written exam (theoretic part) |

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

KOSMATIN FRAS, Mojca, VEZOČNIK, Rok, GVOZDANOVIČ, Tomaž, KOGOJ, Dušan. Complete automation of the relative orientation of a stereopair = Avtomatizacija celotnega postopka relativne orientacije stereopara. Geod. vestn., 2008, letn. 52, št. 2, str. 254-266.

PUCELJ, Boštjan, KOSMATIN FRAS, Mojca, GRIGILLO, Dejan. Primerjava metrične natančnosti analognega in digitalnega fotoaparata visoke ločljivosti = Metric accuracy comparison of the analogue and high resolution digital cameras. Geod. vestn., 2005, letn. 49, št. 2, str. 208-219.

TRIGLAV, Mihaela, RADOVAN, Dalibor, GABROVEC, Matej, KOSMATIN FRAS, Mojca. Acquisition of the 3D boundary of the Triglav glacier from archived non-metric panoramic images. Photogramm. Rec., mar. 2011, letn. 26, št. 133, str. 111-129.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                           |
|----------------------|-------------------------------------------|
| <b>Predmet:</b>      |                                           |
|                      | <b>PRECIZNA KLASIČNA GEODETSKA IZMERA</b> |
| <b>Course title:</b> |                                           |
|                      | <b>PRECISE TERRESTRIAL SURVEYING</b>      |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 2. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1650 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 60         | 0       | 0    | 75            | 0                    | 135             | 9    |

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

|                                    |                                            |
|------------------------------------|--------------------------------------------|
| <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>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <ul style="list-style-type: none"> <li>Geodetske točke – precizna stabilizacija in geodetske mreže – precizne terestrične mreže, klasične terestrične geodetske merske metode in sodobni terestrični geodetski instrumenti,</li> <li>model posredne izravnave, ocena natančnosti merjenih in iskanih količin v horizontalnih in višinskih terestričnih geodetskih mrežah,</li> <li>projekt geodetske mreže: razlogi, pravila, vsebina projekta, optimizacija mreže – osnove s primeri,</li> <li>realizacija geodetske mreže: opis praktičnih primerov preciznih trigonometričnih mrež, zagotovitev dobre oblike mreže,</li> </ul> | <ul style="list-style-type: none"> <li>Introducing: geodetic points – precise stabilization, precise geodetic terrestrial nets, classical terrestrial geodetic measuring methods and modern terrestrial geodetic instruments,</li> <li>redundant measurements: parametric adjustment, precision and accuracy of measuring values and computed coordinates in horizontal and vertical geodetic nets;</li> <li>project of geodetic net: geodetic net optimization – fundamentals with examples,</li> <li>realization of geodetic net: practical examples of precise trigonometric nets, assuring good geodetic net design,</li> </ul> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>elektronski tahimetri: razvoj, tehnične značilnosti, instrumentalni pogreški, zagotovitev pogojev,</li> <li>triangulacija: princip, merjenje horizontalnih smeri (kotov), predhodna računanja, določitev definitivnih koordinat trigonometričnih točk s posredno izravnavo,</li> <li>trilateracija: princip, merjenje dolžin z elektronskimi razdaljemerji, redukcija dolžin, uteži merjenih dolžin, določitev definitivnih koordinat trigonometričnih točk s posredno izravnavo;</li> <li>triangulacijsko trilateracijske mreže: usklajevanje natančnosti kotnih in dolžinskih meritev,</li> <li>trigonometrično višinomerstvo: teoretična natančnost, omejitve trigonometričnega višinomerstva, ocena natančnosti merjenih višinskih razlik, uteži višinskih razlik, določitev višin geodetskih točk s posredno izravnavo,</li> <li>nivelman: merjenje - nivelman kot metoda, digitalni nivelir – delovanje, zagotovitev pogojev, zmanjšanje vplivov okolja, komparacija nivelmanskih lat - upoštevanje konstant late, ocena natančnosti višinskih razlik, uteži.</li> </ul> | <ul style="list-style-type: none"> <li>precise electronic tachometers (total stations): development, technical characteristics, instrumental errors, assuring proper measuring conditions,</li> <li>triangulation: principles, horizontal direction observations, angle measurements, a priori computations, accuracy estimation of measurements, trigonometric points coordinate computation with parametric adjustment,</li> <li>trilateration: principles, electronic distance measurements, distance reductions, measurement accuracy estimation, distance weights.,</li> <li>triangulation – trilateration nets: homogenization of accuracy of angle and distance measurements,</li> <li>trigonometrical heighting: definition, measuring, height difference computation, limitations of trigonometrical heighting, measurement accuracy estimation, weights,</li> <li>levelling: levelling nets, measuring – levelling as measuring method, digital level – technical characteristics, instrumental errors, assuring proper measuring conditions, environmental influences – sinking, refraction, levelling rod comparison – rod equation measuring accuracy estimation, weights.</li> </ul> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Temeljna literatura in viri/Readings:**

Benčić, D., Solarić, N. 2008. Mjerni instrumenti i sustavi u geodeziji i geoinformatiki. Zagreb , Školska knjiga.

Joeckel, R., Stober M., Huep, W. 2008. Elektronische Entfernungs- und Richtungsmessung und ihre Integration in aktuelle Positionierungsverfahren. Heidelberg, Herbert Wichmann Verlag.

Kogoj, D. 2005. Merjenje dolžin z elektronskimi razdaljemerji. Ljubljana, UL - FGG.

Kuang, S. 1996. Geodetic network analysis and optimal design, Concepts and applications, Chelsea, Ann Arbor Press.

Moser, Müller, Schlemmer, 2000. Handbuch Ingeniergeodäsie, Auswertung geodätischer Überwachungsmessung. Heidelberg, Herbert Wichmann Verlag.

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

- študenti prepoznajo in razumejo vrste, namen in uporabnost ter postopek realizacije preciznih terestričnih geodetskih mrež.

**Kompetenci:**

- pozna metode vzpostavljanja in izmere preciznih klasičnih geodetskih mrež, vključno z ustrezno mersko opremo tako z vidika zagotavljanja optimalnih pogojev za meritev, kakor tudi upoštevanja vplivov in potrebnih redukcij za pridobitev horizontalnih koordinat in višin

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

- students recognize and understand types, purpose and applicability including procedures of realization of precise terrestrial geodetic nets.

**Competences:**

- student is familiar with the methods of restoring and measuring precise terrestrial geodetic nets, including measuring equipment, by considering optimal measuring conditions, adequate reductions of measuring values for the

|                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>geodetskih točk v lokalnem koordinatnem sistemu,</p> <ul style="list-style-type: none"> <li>• pozna postopke in pomen simulacije, predhodne izravnavе ter izvedbe projekta geodetske mreže vključno z izračunom najverjetnejših vrednosti iskanih količin z izravnavo ter interpretacijo rezultatov.</li> </ul> | <p>determination of horizontal coordinates and heights of points in local coordinate systems, the procedures of simulations, a priori adjustments and the realization of the project including the procedure of least square adjustment for the determination of the coordinates of the points of local nets and the accuracy interpretation are known.</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Študent dobi znanja s področja materializacije, izmere in izračuna klasičnih terestričnih preciznih geodetskih mrež s poudarkom na izdelavi projekta geodetske mreže in praktični izvedbi projekta.</li> <li>• Razume metode vzpostavljanja in izmere preciznih geodetskih mrež: triangulacija, trilateracija, trigonometrično višinomerstvo in geometrični nivelman.</li> <li>• Spozna precizno terestrično mersko opremo, natančnost, pogoje ter preizkuse za pravilno delovanje.</li> <li>• Spozna metode, potrebne redukcije merskih vrednosti in upoštevanje meteoroloških in drugih vplivov na meritve.</li> <li>• Seznan se z uporabnostjo posamezne vrste geodetske mreže ter s postopki izračuna horizontalnih koordinat in višin z izravnavo.</li> <li>• Študent razume zahteve investitorja oz. naročnika in se zna odločiti za optimalno mersko opremo in metodo izmere.</li> <li>• Strokovna znanja nadgradi z organizacijskimi veščinami, ki zahtevajo tudi samostojno iskanje in odločanje študenta.</li> </ul> | <ul style="list-style-type: none"> <li>• Students acquire knowledge from the field of materialization, measurements and computation of precise terrestrial geodetic nets with the main stress on the realization of the project of the nets their realization.</li> <li>• They understand the methods of definition of precise geodetic nets: triangulation, trilateration, trigonometric heighting, geometric levelling.</li> <li>• They are able to use precise terrestrial measuring equipment, measurement accuracy, working conditions and instrumental test procedures.</li> <li>• They are able to use measuring methods, reductions of measuring values, meteorological influences, etc.</li> <li>• They are able to recognize applicability of different types of precise geodetic nets including adjustment of measurements in horizontal and vertical geodetic nets.</li> <li>• Students understand the investor demands to decide about optimal solution of realization of the net.</li> <li>• Geodetic expert knowledge is supplemented with organizational skills. This demands student's autonomous searching and deciding.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Predavanja: prosojnice, grafične prezentacije, demonstracije, prektični primeri Laboratorijske vaje: računalniška učilnica, uporaba terestričnih geodetskih instrumentov pri terenski izmeri.</p> <p>Konzultacije, spletna učilnica, internet.</p> | <p>Lectures: slides, graphical presentations, demonstrations, practical examples. Practical exercises: computer classroom, use of terrestrial geodetic instruments (total stations, levels) in field use. Consultations, E-classroom, internet.</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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

|                              |         |                         |
|------------------------------|---------|-------------------------|
| Ustni izpit                  | 20,00 % | Oral exam               |
| Pisni izpit (teoretičen del) | 40,00 % | Exam (theoretical part) |
| Vaje                         | 40,00 % | Tutorials (lab. work)   |

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

BOGATIN, Sonja, FOPPE, Karl, WASMEIER, Peter, WUNDERLICH, Thomas A., SCHÄFER, Thomas, KOGOJ, Dušan. Evaluation of linear Kalman filter processing geodetic kinematic measurements. Measurement, 2008, vol. 41, no. 5, str. 561-578.

KOGOJ, Dušan Merjenje dolžin z elektronskimi razdaljmeri, UL, FGG, Ljubljana 2005.

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>GNSS V GEODEZIJI</b> |
| <b>Course title:</b> |                         |
|                      | <b>GNSS FOR GEODESY</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 2. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1183 |
|------------------------------------------------------------|------|

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

|                                   |                                         |
|-----------------------------------|-----------------------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Bojan Stopar, Polona Pavlovčič Prešeren |
|-----------------------------------|-----------------------------------------|

|                                    |                                            |
|------------------------------------|--------------------------------------------|
| <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>                  |
| Matematika I, Matematika II, Fizika                                          | Mathematics I, Mathematics II, Physics |

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| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <ul style="list-style-type: none"> <li>Osnovni pojmi in koncepti satelitske geodezije,</li> <li>zgodovinski razvoj satelitske geodezije,</li> <li>koordinatni in časovni sistemi, pomembni za satelitsko geodezijo,</li> <li>zgodovinski pregled razvoja GNSS (Globalnih satelitskih navigacijskih sistemov), pomen GNSS za geodezijo in družbo,</li> <li>segmenti različnih GNSS sistemov,</li> <li>tirnice satelitov GNSS,</li> <li>satelitski signal in opazovanja v GNSS,</li> <li>linearne kombinacije opazovanj GNSS,</li> <li>vrste GNSS sprejemnikov, zgradba sprejemnika GNSS,</li> </ul> | <ul style="list-style-type: none"> <li>Basic terms and concepts of satellite geodesy,</li> <li>historical development of satellite geodesy,</li> <li>coordinate and time systems important for the satellite geodesy,</li> <li>historical overview of GNSS (Global Navigation Satellite Systems) development, the importance of GNSS in geodesy and society,</li> <li>segments of different GNSS systems,</li> <li>GNSS satellite orbits.</li> <li>satellite signal and GNSS observables, GNSS observations,</li> <li>linear combinations of GNSS observations,</li> </ul> |

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| <ul style="list-style-type: none"> <li>vplivi na opazovanja v GNSS, modeliranje, zmanjšanje in odstranitev vplivov,</li> <li>določitev absolutnega in relativnega položaja: na osnovi kodnih in faznih opazovanj,</li> <li>statična in kinematična določitev položaja,</li> <li>izračun baznih vektorjev statične izmere, izravnavo baznih vektorjev v GNSS mreži,</li> <li>ocenjevanje kakovosti opazovanj,</li> <li>koncept DGNSS in RTK-GNSS,</li> <li>aktivna omrežja in koncepti določanja položaja v teh omrežjih: MRS, VRS, FKP, MAX, i-MAX,</li> <li>podatki in njihov pretok v omrežjih GNSS,</li> <li>metode geodetske izmere GNSS: statične in kinematične, z naknadno obdelavo podatkov meritev in določitvijo položaja v realnem času,</li> <li>povezava koordinat, določenih z izmero GNSS, z drugimi koordinatnimi podatki v prostoru,</li> <li>skupna uporaba terestričnih in opazovanj GNSS za določitev koordinat točk,</li> <li>uporaba in izvedba opazovanj GNSS v nalogah geodetske izmere in geodezije v inženirstvu.</li> </ul> | <ul style="list-style-type: none"> <li>types of GNSS receivers, GNSS receiver structure,</li> <li>influences on GNSS observations, modelling and reduction,</li> <li>absolute and relative positioning using code or phase observations; static and kinematic position determination,</li> <li>calculation of baselines for static surveying, adjustment of GNSS network, that consists from baselines,</li> <li>assessing the quality of GNSS observations,</li> <li>DGNSS and RTK-GNSS concept,</li> <li>GNSS active networks and positioning using different concepts: MRS, VRS, FKP, MAX, i-MAX,</li> <li>data and data-flow in real-time positioning using different GNSS network concepts,</li> <li>static and kinematic positioning methods, post-processing and real-time positioning strategy,</li> <li>mathematical formulation of the relationship of different coordinate data (acquired with the aid of GNSS to other coordinate data 2D or 3D),</li> <li>common application of terrestrial and GNSS data for the determination of coordinates,</li> <li>use of GNSS observations and their implementation in land surveying and engineering surveying.</li> </ul> |
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**Temeljna literatura in viri/Readings:**

El-Rabanny A. 2002. Introduction to GPS-the global positioning system. Boston, London, Artech House.

Guochang, Xu, 2003. GPS, Theory, Algorithms and Applications. Berlin, Springer.

Leick A. 2004. GPS Satellite Surveying. New York, John Wiley & Sohn.

Strang, G., Borre, K., 1997. Linear Algebra, Geodesy, and GPS, Wellesley Cambridge Press.

Stopar, B., Pavlovčič Prešeren P., Kozmus, K. 2010. GPS v geodetski praksi, skripta. Ljubljana, UL FGG.

Wellen Hof, H., Lichtenegger, H., Collins, J. 2005. GPS, Theory and Practice. New York, Springer.

Učno gradivo v spletni učilnici UL FGG.

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

- seznanitev s satelitskimi tehnologijami določanja položaja za potrebe geodezije, z načeli in postopki izvedbe različnih vrst terenske izmere ter obdelave podatkov opazovanj, izvedbo statistične ocene kakovosti opazovanj ter združevanja podatkov GNSS opazovanj s klasičnimi terestričnimi geodetskimi merskimi tehnikami.

**Kompetence:****Objectives and competences:****Objective:**

- giving knowledge of satellite positioning technologies used in geodetic surveying, principles and procedures of surveying methods and observation data processing, assessment of observation quality and GNSS data combinations with conventional terrestrial geodetic measurement techniques.

**Competences:**

- ability of planning, implementation and use of GNSS technology for positioning in geodetic surveying,

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| <ul style="list-style-type: none"> <li>• sposobnost načrtovanja, izvajanja in uporabe tehnologije GNSS za potrebe določanja položaja v geodeziji,</li> <li>• sposobnost določitve kakovostnih koordinat s postopki geodetske izmere GNSS, obdelavo podatkov izmere GNSS, vrednotenje kakovosti pridobljenih rezultatov in</li> <li>• združevanje opazovanj, določenih s postopki izmere GNSS in terestričnimi metodami geodetske izmere, vrednotenje pridobljenih rezultatov.</li> </ul> | <ul style="list-style-type: none"> <li>• ability to define quality of coordinates obtained on the basis of different geodetic survey procedures of GNSS surveying, data processing and quality evaluation of the results and</li> <li>• integration of GNSS observations or processing results with terrestrial geodetic measurement methods and evaluation of the results obtained.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

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| <ul style="list-style-type: none"> <li>• Znanje in razumevanje osnovnih pojmov, zakonitosti in postopkov satelitske geodezije, ki jih uporabljamo v geodetski praksi.</li> <li>• Razumevanje konceptov satelitske geodezije, konceptov delovanja GNSS, različnih vrst opazovanj ter postopkov za določitev položaja na Zemlji z uporabo GNSS tehnologije.</li> <li>• Razumevanje vplivov na opazovanja, načinov za njihovo modeliranje, zmanjšanje ali odstranitev. Razumevanje geodetske izmere v okviru GNSS in postopkov za združeno obravnavanje klasične in izmere GNSS izmere za potrebe geodetske prakse. Združevanje koordinat, določenih v okviru GNSS, s klasično določenimi terestričnimi koordinatami, z ustreznimi postopki transformacij med različnimi koordinatnimi sistemi.</li> <li>• Pridobitev teoretičnih znanj, potrebnih za praktično delo na področju satelitske geodezije s poudarkom na področju uporabe GNSS v geodeziji.</li> </ul> | <ul style="list-style-type: none"> <li>• Knowledge and understanding of basic concepts, principles and methods of satellite geodesy that are used in geodetic surveying practice.</li> <li>• Understanding the concepts of satellite geodesy, specific GNSS concepts, distinction of different types of observables and procedures for position determination with the GNSS technology.</li> <li>• Understanding the impacts on observations, methods for their modelling, reduction or removal. Understanding of geodetic surveys in the context of GNSS and procedures for the common treatment of terrestrial methods and GNSS methods for positioning purposes.</li> <li>• Combination of different coordinates (acquired with GNSS positioning and with classical terrestrial measurements) with the use of transformation procedures between different coordinate systems.</li> <li>• Theoretical knowledge, required for practical work in the field of satellite geodesy with emphasis on the usage of GNSS in the field of geodetic surveying.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

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| <p>Predavanja potekajo v obliki ex-katedra z uporabo sodobnih učnih pripomočkov, grafičnih prikazov, demonstracij in osnovnih praktičnih primerov.</p> <p>Praktične vaje potekajo v obliki praktičnih vaj v učilnici.</p> | <p>Lectures are in ex-cathedra form, where different teaching aids, such as charts, demonstrations, case studies and simulations are used for more detailed explanations.</p> <p>Exercises are performed in combination with field work (detail GNSS surveying measurements) and pre- or further observation processing in the computer classroom.</p> |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

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| Ustni zagovor izdelanih elaboratov vaj | 50,00 % | Oral defence of technical reports of elaborated exercises |
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| Pisni izpit (teoretičen del) | 50,00 % | Written exam (theoretical part) |
|------------------------------|---------|---------------------------------|

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

KOZMUS TRAJKOVSKI, Klemen, STERLE, Oskar, STOPAR, Bojan. Sturdy Positioning with High Sensitivity GPS Sensors Under Adverse Conditions. *Sensors*, 2010, letn. 10, št. 9, str. 8332-8347, ilustr., doi: 10.3390/s100908332.

PAVLOVČIČ PREŠEREN, Polona, STOPAR, Bojan. Wavelet Neural Network employment for continuous GNSS orbit function construction: Application for the Assisted - GNSS principle. *Applied soft computing*, 2013, letn. 13, št. 5, str. 2526-2536, ilustr., doi: 10.1016/j.asoc.2012.11.034.

PAVLOVČIČ PREŠEREN, Polona, STOPAR, Bojan. Izračun položaja GPS-satelita iz podatkov preciznih efemerid = GPS-orbit computation from precise ephemeris data. *Geod. vestn. [Tiskana izd.]*, 2005, letn. 49, št. 2, str. 177-190.

PAVLOVČIČ PREŠEREN, Polona, STOPAR, Bojan. Wavelet Neural Network employment for continuous GNSS orbit function construction: Application for the Assisted - GNSS principle. *Applied soft computing*, 2013, letn. 13, št. 5, str. 2526-2536. PAVLOVČIČ PREŠEREN, Polona, STOPAR, Bojan, VRABEC, Marko. Hitrosti premikov ob prelomih v vzhodni Sloveniji: opazovanja iz let 1996, 1999 in 2002 = Displacement rates along the faults in NE Slovenia: campaigns from 1996, 1999 and 2002. *Geod. vestn. [Tiskana izd.]*, 2005, letn. 49, št. 3, str. 407-415.

WEBER, John, VRABEC, Marko, PAVLOVČIČ PREŠEREN, Polona, DIXON, Tim, JIANG, Yan, STOPAR, Bojan. GPS-derived motion of the Adriatic microplate from Istria Peninsula and Po Plain sites and geodynamic implications. *Tectonophysics (Amst.)*. [Print ed.], mar. 2010, vol. 483, iss. 3-4, str. 214- 222, ilustr., doi: 10.1016/j.tecto.2009.09.001.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                            |
|----------------------|----------------------------|
| <b>Predmet:</b>      |                            |
|                      | <b>UVOD V PRAVO</b>        |
| <b>Course title:</b> |                            |
|                      | <b>INTRODUCTION TO LAW</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 2. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1641 |
|------------------------------------------------------------|------|

| 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> | Aleš Novak, Matej Accetto, Tilen Štajnpihler Božič |
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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>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <ul style="list-style-type: none"> <li>Država: pojem države, zasnova državne oblasti v Republiki Sloveniji (poglavitni ustavni organi), organizacija izvršilne veje oblasti (ministrstva, organi v sestavi ministrstev, upravne enote in njihove organizacijske enote, javno pooblastilo, javne službe), lokalna samouprava, temeljni pravni postopki (ustavodajni, zakonodajni postopek, sodni postopki, upravni postopek).</li> <li>Pravna država: razvoj in pojem (s poudarkom na prvinah pravne države v slovenskem pravnem redu), pomen spoštovanja postopkovnih zahtev v upravnih in sodnih postopkih,</li> </ul> | <ul style="list-style-type: none"> <li>The State: the concept of a state, the outline of state authorities in the Republic of Slovenia, the organisation of the Executive (state ministries etc., legal entities and natural persons vested with the public authority to perform certain duties of the state administration etc.), local self-government, basic types of legal procedures (procedure for amending the constitution, criminal procedure, civil procedure, administrative procedure).</li> <li>Rule of law: development and concept of the rule of law (with emphasis on Slovenian constitutional and legal order), importance of</li> </ul> |

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| <ul style="list-style-type: none"> <li>• Pojem prava: pravno pravilo in pravno načelo; pravica, dolžnost in dolžnostno upravičenje; zloraba pravice.</li> <li>• Sistemizacija prava: notranje in mednarodno pravo. pravo EU (temeljna načela prava EU, veljavnost v RS), javno in zasebno pravo; pravo (urejanja) okolja med javnim in zasebnim pravom, temeljne pravne panoge (okvirna predstavitev temeljnih značilnosti).</li> <li>• Hierarhija pravnih aktov: vrste (notranjih) pravnih aktov in njihova medsebojna razmerja (s poudarkom na predpisih, ki se nanašajo na urejanje okolja): ustava, podzakonski akti, akti lokalnih skupnosti; vsebinska in postopkovna skladnost pravnih aktov, položaj mednarodnih pogodb v slovenskem pravnem redu, položaj sekundarnih pravnih virov prava EU v slovenskem pravnem redu: uredbe, direktive, sklepi, priporočila in mnenja.</li> <li>• Temeljni pravni viri (slovenskega prava): ustava in zakon, podzakonski akti in legalitetno načelo, uporaba pravnih virov v upravnih postopkih.</li> <li>• Razlaga pravnih aktov: metode razlage in razlagalni argumenti, pravne praznine, posebnosti razlage v javnem in zasebnem pravu.</li> <li>• Odprta javna uprava: dostop do informacij javnega značaja, sodelovanje javnosti pri pripravi predpisov, analiza učinkov predpisov (RIA).</li> <li>• Upravna odločba in sklep: vrste upravnih odločb: deklarativne in konstitutivne odločbe, pozitivna in negativna odločba, odločba, izdana po uradni dolžnosti, in odločba, izdana na zahtevo stranke, sestavine upravne odločbe, sklepi.</li> <li>• Oris upravnega procesnega prava: temeljna načela upravnega procesnega prava, zastopanje stranke, vabljenje stranke, vročanje, vzdrževanje reda, postopek sprejemanja upravnih odločb, vrste upravnih postopkov (ugotovitveni postopek, skrajšani ugotovitveni postopek, poseben ugotovitveni postopek), dokazovanje, odločanje po prostem preudarku.</li> <li>• Pritožbeni postopek: razlogi za pritožbo, odločanje pritožbenega organa.</li> </ul> <p>Upravni spor: pojem, predmet upravnega spora in pooblastila sodišča, postopek in odločanje.</p> | <p>procedural safeguards in court and administrative procedures.</p> <ul style="list-style-type: none"> <li>• The concept of Law: legal rule and legal principle, right, duty, mandatory right, the abuse of right</li> <li>• The systematisation of law: internal and international law, EU law (basic principles, applicability in the Slovenian legal order), public and private law, basic legal disciplines (the outline of characteristics).</li> <li>• The hierarchy of legal acts: types of legal acts in Slovenian legal order and their interrelations (with special emphasis on environmental law): Constitution, Act of Parliament, Regulations, Local by-laws; two aspects of internal compatibility: content and procedure, international agreements in Slovenian legal order, secondary legal sources of EU law in Slovenian legal order: regulations, directives, decisions, recommendations, opinions.</li> <li>• Basic legal sources (of Slovenian Law): Constitution, Acts of Parliament, regulations and the principle of legality, the use of legal sources in administrative procedure.</li> <li>• Interpretation of law: methods of interpretation, legal gaps, legal interpretation in private and public law.</li> <li>• Open public administration: right to access to public information, public participation in law-making process, regulatory Impact Analysis.</li> <li>• Administrative decisions: types of administrative decisions: declarative and constitutive decisions, positive and negative decisions, decisions issued ex officio and on the demand of a party to a procedure, elements of administrative decision, procedural decisions.</li> <li>• The outline of administrative law: basic principles, representation of a party to a procedure, subpoenas, serving subpoenas, order during the procedure, administrative procedure, types of administrative procedures, types of evidence, discretion.</li> <li>• The appeal: reasons, decisions by the appeals tribunal.</li> <li>• Judicial review of administrative decisions: the concept of judicial review of administrative decisions, the object of the review and the powers of the court, court decisions.</li> </ul> |
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### Temeljna literatura in viri/Readings:

Accetto, M.2013. Pravo Evropske unije (preglednica), 3. Spremenjena in dopolnjena izdaja. Ljubljana, GV Založba.

Androjna, V., Kerševan, E. 2006. Upravno procesno pravo – Upravni postopek in upravni spor. Ljubljana, GV Založba.

Cerar, M., Bohinc, R., Rajgelj, B. 2006. Temelji prava in pravne ureditve. Ljubljana, GV Založba.

Cerar, M., Novak, A., Pavčnik, M. 2012. Uvod v pravoznanstvo (2. pregledana, spremenjena in dopolnjena izdaja), Ljubljana, Založba Uradni list.

#### Cilji in kompetence:

##### Cilji:

- predmet študentom omogoča temeljno razumevanje prava, slovenskega pravnega sistema in slovenske državne ureditve ter jim ponudi temeljna znanja s področja upravnega in upravnega procesnega prava,
- predmet je zasnovan v dveh sklopih. V prvem se bodo študenti seznanili s temeljnimi prvinami sodobnih držav, pravnih sistemov ter z najpomembnejšimi pravnimi pojmi, institucijami in panogami, s katerimi se bodo srečevali pri svojem delu,
- v drugem bodo pridobili osnoven pregled nad upravnim pravom, zlasti upravnim procesnim pravom. Študenti se bodo seznanili z vrstami upravnih odločb, temeljnimi načeli upravnega postopka in spoznali postopek odločanja upravnih organov.

##### Kompetenca:

- študent bo v okviru tega predmeta pridobil temeljne veščine (na osnovni ravni), ki jih bo potreboval za iskanje in razumevanje zakonodaje, njeno uporabo ter sposobnost oblikovanje enostavnih upravnih odločb.

#### Objectives and competences:

##### Objectives:

- the objective of the course is to introduce students to basic legal elements in modern states with basic legal terms, institutes and branches,
- learning about law will be related to the framework of the Slovene system of authority, constitutional order and legal system, with special emphasis on those legal areas that students of geodesy and geoinformatics meet most frequently (regulations from the area of spatial planning, protection of natural and cultural heritage, construction, etc.).

##### Competence:

- within the course student will gain basic knowledge and skills to search for, understand and use relevant contents on the level of legislation and implementing regulation and basic understanding of legal (mainly inspection) procedures.

#### Predvideni študijski rezultati:

- Razumevanje državne ureditve Republike Slovenije.
- Razumevanje pravnega sistema, zlasti poglavitnih pravnih virov (ustave, zakona, podzakonskega akta) in njihovega medsebojnega razmerja.
- Poznavanje temeljnih pravnih panog in njihovih medsebojnih razlik.
- Razumevanje uporabe (razlage) splošnih pravnih aktov (pri, npr. pripravi posamičnih pravnih aktov).
- Poznavanje poglavitnih vrst upravnih odločb.
- Poznavanje temeljnih načel upravnega postopka.
- Poznavanje poteka upravnega postopka in odločitev, ki jih upravni organi lahko sprejemajo.

#### Intended learning outcomes:

- Understanding of system of government; understanding of legal system, especially main legal sources (constitution, law, implementing acts) and their inter-relations.
- Understanding of the use of general legal acts (e.g. when preparing individual legal acts).
- Knowledge of the main types of individual legal acts (mainly administrative decision, judgement); understanding different mechanisms of legal protection (mainly inspection control).
- Understanding the main characteristics of basic legal branches (with special emphasis on property law and its basic institutes).

#### Metode poučevanja in učenja:

#### Learning and teaching methods:

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| Predavanja in vaje potekajo v učilnici, opremljeni z računalnikom in diaprojektorjem za prikazovanje. | Lectures and tutorials are held in lecture room equipped with computer and slide projector. |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

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|-------------------------------------------------|---------|---------------------------------------------|
| Pisni izpit in/ali ustni izpit (teoretični del) | 80,00 % | Written and/or oral exam (theoretical part) |
| Naloge in sprotno delo                          | 20,00 % | Exercises and homework                      |

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

ACCETTO, Matej, ZLEPTNIG, Stefan. The principle of effectiveness: rethinking its role in community law. European public law, ISSN 1354-3725, Sep. 2005, vol. 11, issue 3, str. 375-403. [COBISS.SI-ID 7454289]

ACCETTO, Matej. The past and possible futures of European Union judicature. V: BĚLOHLÁVEK, Alexander J. (ur.), ROZEHNALOVÁ, Naděžda (ur.). The relationship between constitutional values, human rights and arbitration, (Czech (& Central European) yearbook of arbitration, ISSN 2157-9490, vol. 1, 2011). New York: Juris Publishing: Juris Net, cop. 2011, str. 3-22. [COBISS.SI-ID 11599953]

ACCETTO, Matej. Izgradnja Evrope: od razvoja ideje Evrope do njene ustavne prihodnosti, (Zbirka Scientia iustitia, 08). Ljubljana: Uradni list Republike Slovenije, 2006. 309 str. ISBN 961-204-373-6. ISBN 978-961-204-373-5. [COBISS.SI-ID 229212672]

NOVAK, Aleš. Narava in meje zavezujoče moči prava: doktorska disertacija. Ljubljana: [A. Novak], 2003. 427 f.

NOVAK, Aleš. O definiciji prava. Zb. znan. razpr. (Prav. fak. 1991), 2001, letn. 61, str. [81]-101.

NOVAK, Aleš. Zmuzljiva narava pravnih načel. Zb. znan. razpr. (Prav. fak. 1991), 2010, letn. 70, str. 211-241.

NOVAK, Aleš. Alkimija prava: Ronald Dworkin in sodnikovo ustvarjanje pravičnosti, v: Ronald Dworkin: Izbrane razprave. Ed. Aleš Novak. GV Založba: Ljubljana 2011, str. 11-92.

ŠTAJNPIHLER, Tilen: Temelji obveznosti obrazložitve pravnih odločitev. Zb. znan. razpr. (Prav. fak. 1991), 2009, letn. 69, str. 253-283. ŠTAJNPIHLER, Tilen: Prispevek k interpretaciji načela enakega obravnavanja. Zb. znan. razpr. (Prav. fak. 1991), 2008, letn. 68, str. 233-259.

ŠTAJNPIHLER, Tilen: Precedenčni učinek sodnih odločb pri pravnem utemeljevanju, (Zbirka Scientia iustitia, 20). 1. natis. Ljubljana: GV založba, 2012. 288 str. ISBN 978-961-247-221-4.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                       |
|----------------------|---------------------------------------|
| <b>Predmet:</b>      |                                       |
|                      | <b>UREJANJE PODEŽELSKEGA PROSTORA</b> |
| <b>Course title:</b> |                                       |
|                      | <b>RURALPLANNING</b>                  |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 3. letnik | Zimski   |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1195 |
|------------------------------------------------------------|------|

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

|                                   |                        |
|-----------------------------------|------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Alma Zavodnik Lamovšek |
|-----------------------------------|------------------------|

|                                    |                                            |
|------------------------------------|--------------------------------------------|
| <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>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Predavanja:</b> <ul style="list-style-type: none"> <li>Pojem podeželja, njegove funkcije, več funkcionalni pomen podeželja, urbano- ruralni kontinuum, podeželska naselja in njihove funkcije, kmetijska proizvodnja in njene težnje pri nas in v svetu.</li> <li>Naravne in družbene razmere v podeželskem prostoru Slovenije: naravne primernosti za razvoj kmetijstva, usmerjenost kmetijstva, zemljiško- posestne razmere, infrastrukturna opremljenost, proizvodna sposobnost usmeritve za celovit razvoj podeželja v evropskih državah, verificirani cilji in usmeritve za celovit razvoj</li> </ul> | <b>Lectures:</b> <ul style="list-style-type: none"> <li>The notion of rural areas and their functions, multifunctional significance of rural areas, urban-rural continuum, rural settlements and their functions, agricultural production and its tendencies in Slovenia and abroad.</li> <li>Natural setting and social conditions in agricultural areas of Slovenia: natural conditions for agricultural development, agricultural orientation, land ownership situation, infrastructure, productivity. Objectives of rural development: objectives and trajectories for integrated rural development in European</li> </ul> |

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| <p>podeželja v RS, ukrepi za varovanje naravnih dobrin v podeželskem prostoru, normativno-pasivni ukrepi.</p> <ul style="list-style-type: none"> <li>• Urejanje in razvoj podeželskih naselij: celovit pristop pri urejanju in razvoju podeželskih naselij, vloga in pomen interdisciplinarnega dela ter pomen posameznih sektorskih usmeritev, podatkovne baze za razvoj in urejanje naselij, kmetijstvo in njegove zahteve pri razvoju vasi, uskladitev posameznih rab prostora v vasi, komunalno urejanje vasi, načrt za prenovo, sanacijo in rekonstrukcijo vasi, širitev vasi, pridobivanje stavbnih zemljišč.</li> <li>• Urejanje podeželskega prostora z agrarnimi operacijami ter posamezne faze pri realizaciji teh projektov ob upoštevanju celostnih potreb po prostoru.</li> </ul> <p><b>Vaje:</b></p> <ul style="list-style-type: none"> <li>• Študent na izbranem podeželskem območju izvede celoten proces analize in sinteze prostora; Na podlagi analitičnega dela pripravi celovito prostorsko zasnovo razvoja vasi in njene okolice ter rezultate svojega dela ustrezno utemelji; Vaje se delno izvedejo organizirano, delno individualno. Vključujejo ogled terena ter praktično delo na terenu ter izdelavo vseh ključnih prostorskih vsebin v kartografski obliki. Vaje se izdelujejo s pomočjo razpoložljive programske opreme.</li> <li>• Terensko delo: terenski ogled obravnavanega naselja ter izdelava terenske dokumentacije za prenos evidentiranih vsebin v proces načrtovanja.</li> </ul> | <p>countries, verified objectives and trajectories for integrated rural development in the RS, measures to protect natural assets in rural areas, normative/passive measures.</p> <ul style="list-style-type: none"> <li>• Management and development of rural settlements: integrated approach to planning and development of rural settlements, role and significance of interdisciplinary work and significance of various sectorial trajectories, databases for settlement development and planning, agriculture and its requirements in village development, reconciliation of land uses in villages, public utilities in villages, village renovation, remediation and reconstruction design, village expansion, acquisition of building land, etc.</li> <li>• Rural planning using agricultural operations, stages of realization of these projects, considering the overall spatial needs.</li> </ul> <p><b>Tutorials:</b></p> <ul style="list-style-type: none"> <li>• Tutorial assignments completed as scheduled and accepted are a prerequisite for admission to examinations. Student conducts spatial analysis and synthesis for a selected case of rural development; Based on the analytical part, student elaborates the overall spatial development design of a village and its surroundings, and defends the results of his/her work. The tutorials are delivered either in organized classroom setting or individually. Tutorials include site visits and field work, and elaboration of all key spatial contents in cartographic format. The tutorial assignment is elaborated using the available software.</li> <li>• Field work: Site visit of the settlement in question and elaboration of a field report for the transfer of the recorded information to the planning process.</li> </ul> |
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#### Temeljna literatura in viri/Readings:

Dewey, T. 2012. Rural Design, a new design discipline. Routledge, London.

Fikfak, A., Gabrijelčič, P. 2002. Rurizem in ruralna arhitektura, UL FA, Ljubljana.

Foški, M., Zavodnik Lamovšek, A. 2015. Gradiva za predmet Urejanje podeželskega prostora.

Gostović, M. 1989 Uređenje seoske teritorije, Naučna knjiga, Beograd.

Stritar, A. 1990. Krajina, krajinski sistemi, raba in varstvo tal v Sloveniji, Partizanska knjiga, Ljubljana.

Učno gradivo v spletni učilnici UL FGG.

#### Cilji in kompetence:

#### Objectives and competences:

##### Cilji:

##### Objectives:

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| <ul style="list-style-type: none"> <li>• študente spoznati s posebnostmi podeželskega prostora, razumevanjem prepletenosti sektorskih vsebin, celovitostjo razmišljanja in načrtovanja,</li> <li>• študente na konkretnem primeru (izbrani vasi) soočiti s procesom priprave prostorskih vsebin za podeželski prostor in načinom usklajevanja interesov v prostoru,</li> <li>• razumevanje pomena urejanja podeželskega prostora z vidika varstva krajine, razvoja kmetijstva, razvoja in revitalizacije vasi,</li> <li>• razumevanje pomena in možnosti kmetijsko ureditvenih operacij pri celostnem razvoju vasi in podeželja.</li> </ul> <p><b>Kompetence:</b></p> <ul style="list-style-type: none"> <li>• poznavanje postopkov izdelave projektov za urejanje podeželskega prostora,</li> <li>• možnost sodelovanja v interdisciplinarnih skupinah za razvoj podeželja,</li> <li>• poznavanje vsebin zemljiško ureditvenih operacij za celostno urejanje podeželja.</li> </ul> | <ul style="list-style-type: none"> <li>• to familiarize students with the specifics of rural areas, understanding the mix of sectorial concerns, integrated thinking and planning,</li> <li>• to confront students, on a specific case (selected village), with the process of elaboration of spatial contents for rural areas, including the coordination of territorial interests,</li> <li>• understanding the significance of rural management in view of landscape conservation, agricultural development, village development and revitalization,</li> <li>• understanding the significance and possibilities of agricultural development activities in integrated village and rural development.</li> </ul> <p><b>Competences:</b></p> <ul style="list-style-type: none"> <li>• knowledge of procedures of elaboration of rural planning schemes,</li> <li>• ability to work in interdisciplinary groups for rural development,</li> <li>• knowledge of topics of land development activities for integrated rural development.</li> </ul> |
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**Predvideni študijski rezultati:**

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| <ul style="list-style-type: none"> <li>• Znanje in razumevanje osnovnih strokovnih pojmov, metod načrtovanja podeželja, posebnosti podeželskega prostora ter zakonitosti in postopkov, pomembnih pri nastajanju prostorskih načrtov.</li> <li>• Sposobnost uporabe znanja iz urejanja prostora in izdelave projektov za urejanje podeželskega prostora.</li> <li>• Uporaba pridobljenega vedenja o podeželju in načrtovanju podeželskega prostora pri geodetskih delih.</li> <li>• Kritičen odnos do podeželskega prostora.</li> <li>• Na osnovi teoretičnega znanja in praktično pridobljenih izkušenj sposobnost kritične presoje ustreznosti in primernosti načrtov za urejanje podeželskega prostora in druge posege v prostor.</li> <li>• Študenti se navajajo na povezovanje izredno širokega spektra s planiranjem povezljivih naravoslovnih, družboslovnih in tehničnih znanosti, ki so potrebne za sintezno razumevanje urejanja podeželskega prostora.</li> </ul> | <p><b>Intended learning outcomes:</b></p> <ul style="list-style-type: none"> <li>• Knowledge and understanding of key terminology, rural planning methods, specifics of rural areas, and rules and procedures relevant to elaboration of spatial designs.</li> <li>• Ability to use the know-how in spatial planning and elaboration of rural planning schemes.</li> <li>• Use of acquired knowledge on rural areas and rural planning in surveying.</li> <li>• Critical attitude to rural areas.</li> <li>• Ability of critical assessment of relevance and adequacy of rural planning schemes and other developments, based on theoretical knowledge and practical experience.</li> <li>• Students get accustomed to connecting a wide range of sciences related to planning, i.e. natural sciences, social and technical sciences, necessary for the synthetic understanding of rural planning.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

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| Predavanja: v predavalnici, uporaba sodobnih metod poučevanja (grafične ponazoritve, demonstracije, primeri iz prakse). | Lectures: in the classroom, use of contemporary teaching methods (graphical presentation, demonstrations, practical cases). |
| Praktične vaje: izvedba v računalniški učilnici, projektno praktično delo, terenski ogled                               | Practical (tutorials): in the computer classroom, project-based practical work, site visits.                                |

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

|                                                                                                                    |         |                                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| Izpit Terensko delo (udeležba)                                                                                     | 50,00 % | Exam Field work (attendance)                                                                                                                      |
| Projektna naloga, oddaja v obliki projekta, po potrebi ustni zagovor z utemeljevanjem rešitev (ustna predstavitev) | 50,00 % | Seminar thesis (project assignment), submission in project format, oral defence and argumentation – applicable as appropriate (oral presentation) |

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

FIKFAK, Alenka, MRAK, Gašper, ZAVODNIK LAMOVŠEK, Alma. The Challenges of modern concepts of sustainable "rurbanity" in the 21st century = Izazovi sodobnih konceptov održivog razvoja ruralno-urbanih područja u 21. stoljeću. V: KARAČ, Zlatko (ur.). Rethinking urbanism: International scientific conference, Faculty of Architecture, University of Zagreb, 19th May 2012: Proceedings book. Zagreb: Croatian Architects' Association, cop. 2012, str. 115-118, ilustr.

MRAK, Gašper, ZAVODNIK LAMOVŠEK, Alma, FIKFAK, Alenka. Turizem in poselitveni vzorci na podeželju: na primeru razvoja poselitve v slovenskih Alpah = Tourism and settlement patterns in rural countryside in case of the settlement development in the Slovenian Alps. AR, Arhit. razisk. (Tisk. izd.). [Tiskana izd.], 2012, [Št.] 1, str. 32-41, ilustr.

ZAVODNIK LAMOVŠEK, Alma, KUNSTELJ, Meta. Različni pristopi k proučevanju odnosov med mestnimi in podeželskimi območji = Different approaches to assessment of relations between urban and rural areas. V: ZAVODNIK LAMOVŠEK, Alma (ur.), FIKFAK, Alenka (ur.), BARBIČ, Ana (ur.). Podeželje na preizkušnji: jubilejna monografija ob upokojitvi izrednega profesorja dr. Antona Prosenca. V Ljubljani: Fakulteta za gradbeništvo in geodezijo: Geodetski inštitut Slovenije, 2010, str. 30-38, ilustr.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                            |
|----------------------|--------------------------------------------|
| <b>Predmet:</b>      |                                            |
|                      | <b>EKONOMIKA IN MANAGEMENT V GEODEZIJI</b> |
| <b>Course title:</b> |                                            |
|                      | <b>ECONOMICS AND MANAGEMENT IN GEODESY</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 3. letnik | Zimski   |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1682 |
|------------------------------------------------------------|------|

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

|                                   |                           |
|-----------------------------------|---------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Marjan Čeh, Marko Hočevar |
|-----------------------------------|---------------------------|

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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>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <ul style="list-style-type: none"> <li>Ekonomika poslovanja (ekonomija in ekonomski problem, osnove finančne matematike, časovna vrednost denarja), tržno gospodarstvo (tržni mehanizmi, tržno oblikovanje cen, popolna in nepopolna konkurenca).</li> <li>Osnove podjetništva, prvine poslovnega procesa, analiza in optimizacija poslovnih procesov, poslovni izidi.</li> <li>Temelji organizacije in managementa (klasične in sodobne oblike organizacije, poslovne funkcije in proces), ravni managementa, strateško planiranje in management, poslanstva in postavljanje ciljev organizacij, sistemska</li> </ul> | <ul style="list-style-type: none"> <li>Business economics (economy and economic problem, basics of financial mathematics, time value of money), market economy (market mechanisms, market price, competitive and non- competitive market).</li> <li>Basic entrepreneurship, elements of business process, analysis and optimization of business processes, business outcomes.</li> <li>Fundamentals of organization and management (classic and modern forms, business functions and processes), levels of management, strategic planning and management, missions and aims of organization; system theory in organization,</li> </ul> |

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| <p>teorija v organizaciji, problemske analize in rešitve (pristop LFA), teorija regulacije.</p> <ul style="list-style-type: none"> <li>• Metode raziskav, priprava strokovnih poročil, strokovno pisanje.</li> <li>• Projektno vodenje v geodeziji in geoinformatiki: projekt in projektno delo, timsko in skupinsko delo, tehnike ustvarjalnega razmišljanja, vodenje projekta, nadzor, mrežno planiranje.</li> <li>• Upravljanje človeških virov: naloge koordinacije in motivacije, vodenje sestankov, osnove komunikacije, javne obravnave, posebnosti reševanja konfliktov v geodeziji (zemljiški kataster in mejni spori), analiziranje in optimizacija delovnih procesov v geodeziji, informacijski sistemi za vodenje in nadzor organizacij, modeliranje postopkov.</li> <li>• Organizacija geodetskih del v Sloveniji in izbranih državah, institut geodeta in odgovornega geodeta, analiza stroškov transakcij v geodeziji in geoinformatiki, sodno izvedeništvo, geodetska inšpekcija, interesna združenja geodetov v Sloveniji, mednarodna združenja.</li> <li>• Poklicni kodeks geodetov (FIG), kodeks odgovornih inženirjev (IZS), Trendi razvoja geodetske stroke v svetu (javna služba, zasebna podjetja).</li> </ul> | <p>problem analyses and solutions (LFA approach), theory of regulation.</p> <ul style="list-style-type: none"> <li>• Research methods, preparation of professional reports, professional writing.</li> <li>• Project management in geodesy and geoinformation: project, project work, working in a group or team, creativity thinking, project planning and scheduling, network planning.</li> <li>• Management of human resources: coordination and motivation, coordination of business meetings, basics of communication, public hearing, conflict solutions in geodesy (land cadastre and boundary disputes), analyses and optimization of workflows in geodesy, information systems for management and control, modelling of procedures.</li> <li>• Organization of surveying in Slovenia and selected countries, institute of land surveyor and chartered surveyor, analyses of transaction costs in geodesy and geoinformation, surveying experts at the court, surveying inspection, non-governmental associations in Slovenia and at the international level.</li> <li>• Professional codex of a surveyor (FIG), codex of chartered engineers in Slovenia, international trends in the fields of surveying (public and private services).</li> </ul> |
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#### Temeljna literatura in viri/Readings:

Bertoncelj, A., Meško, M., Naraločnik, A., Nastav, B. 2011. Trajnostni razvoj organizacije - ekonomski, družbenopolitični in ekološki vidiki. Ljubljana, GV založba.

Hauc, A. 2007. Projektni management. Ljubljana, GV založba.

Igličar, A., Hočevnar, M., Zaman Groff, M., *Osnove računovodstva*, (Učbeniki Ekonomske fakultete). Ljubljana: Ekonomska fakulteta, 2017. V, 452 str.

Mihelčič, M. 2009. Ekonomika poslovanja za inženirje. Ljubljana, UL Fakulteta za računalništvo in informatiko.

#### Cilji in kompetence:

##### Cilji:

- poznavanje osnov ekonomike poslovanja,
- poznavanje teoretičnih načel upravljalne in organizacijske teorije,
- poznavanje organizacije geodetske dejavnosti v Sloveniji in v tujini (javna služba, izvajalci geodetskih storitev z javnimi pooblastili; odgovornost pri izvajanju geodetskih storitev),
- poznavanje poklicnega kodeksa geodeta in kodeksa odgovornih inženirjev.

##### Pridobljene kompetence:

#### Objectives and competences:

##### Objectives:

- Basic knowledge about business economics.
- Understanding the principles of managerial and organization theory.
- Knowledge about organization of surveying services in Slovenia and in foreign countries (public service, chartered or publicly authorized surveyors, responsibilities at surveying services);
- Knowing the professional codex of surveyor and codex of chartered engineers in Slovenia.

##### Competences:

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| <ul style="list-style-type: none"> <li>• znanje in razumevanje osnovnih strokovnih pojmov, zakonitosti in postopkov, organizacije dela ter vodenja projektov, pomembnih pri podjetništvu kakor tudi javnih službah (javne geodetske in sorodne službe),</li> <li>• uporaba znanj v poslovni karieri kot lastnik podjetja ali manager javne organizacije oziroma član/vodja projektnega tima,</li> <li>• sposobnost povezovanja izredno širokega spektra z geodezijo povezljivih nalog, ki se izvajajo tako za državno službo kot zasebne naročnike in</li> <li>• sposobnost kritične presoje ustreznosti in primernosti organizacije dela v podjetjih, javnih (geodetskih) službah in pri vodenju projektov.</li> </ul> | <ul style="list-style-type: none"> <li>• knowledge and understanding of basic terminology, regulation and procedures, organization of work and project management, important for private enterprises and public sector (public surveying and similar services),</li> <li>• use of knowledge in professional career as enterprise owner, manager of a public institution or leader of a project team,</li> <li>• ability to link different tasks in the field of geodesy and related fields, which are conducted in the framework of public and private services – for public and private parties and</li> <li>• ability for critical assessment of suitability of enterprise organization, organization of activities in public (surveying) institutions and project management.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

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| <ul style="list-style-type: none"> <li>• Razumevanje vloge in odgovornost geodeta pri različnih geodetskih in interdisciplinarnih nalogah (v povezavi z dejavnostmi prostorskega načrtovanja, gradbeništva, poseganja v prostor, odločitvenimi procesi v prostoru).</li> <li>• Poznavanje temeljnih vsebin in pojmov iz poslovne ekonomike, managementa, organizacije geodetskih del.</li> <li>• Poznavanje organizacije geodetske in sorodne dejavnosti v Sloveniji,</li> </ul> | <ul style="list-style-type: none"> <li>• Understanding the role and responsibilities of a surveyor at different surveying and interdisciplinary services (related to the fields of spatial planning, civil engineering, spatial interventions, spatial decision making).</li> <li>• Understanding basic terminology and knowledge in the field of business economics, management, and organization of surveying work.</li> <li>• Understanding the organization of the surveying and related profession in Slovenia.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

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| <p>Predavanja: uporaba sodobnih metod poučevanja (grafične ponazoritve, demonstracije, primeri iz prakse).</p> <p>Vaje: v računalniški učilnici, individualno delo in delo v skupinah, problemsko reševanje.</p> | <p>Lectures: use of modern didactic methods (graphical presentations, tutorials, case studies).</p> <p>Tutorials: in computer rooms, individual work and work in groups, problem solving approach.</p> |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                                  |         |                                          |
|----------------------------------|---------|------------------------------------------|
| Ocene vaj, nalog in sprotne dela | 40,00 % | Exercises and collaboration at tutorials |
| Pisni izpit                      | 60,00 % | Written exam                             |

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

KREMLJAK, Zvonko, HOČEVAR, Marko. Stochastic planning - Forecasting sales and profits in the production system. V: KATALINIĆ, Branko (ur.). *DAAAM International scientific book 2016*, (DAAAM International scientific book, ISSN 1726-9687). Vienna: DAAAM International Vienna. 2016, str. 25-38.

IGLIČAR, Aleksander, HOČEVAR, Marko, ZAMAN GROFF, Maja. *Osnove računovodstva*, (Učbeniki Ekonomske fakultete). Ljubljana: Ekonomska fakulteta, 2017. V, 452 str.

LISEC, Anka, ČEH, Marjan, FERLAN, Miran, STOPAR, Bojan, KOSMATIN FRAS, Mojca, MLINAR, Alenka. Organizacija javne geodetske službe v nekaterih izbranih tujih državah = Organization of the public mapping and surveying services in the selected countries. *Geodetski vestnik: glasilo Zveze geodetov Slovenije*, ISSN 0351-0271. [Tiskana izd.], 2016, letn. 60, št. 3, str. 517-530

KRIVIC, Mateja, LISEC, Anka, FERLAN, Miran, ČEH, Marjan. Razvojne usmeritve na področju zemljiškega katastra in zemljiške administracije = Development guidelines in the field of land cadastre and land administration. *Geodetski vestnik: glasilo Zveze geodetov Slovenije*, ISSN 0351-0271. [Tiskana izd.], 2014, letn. 58, št. 4, str. 710-723

ČEH, Marjan, LISEC, Anka. Initiation of permanent strategic studies at the surveying and mapping authority in the Republic of Slovenia. V: ALEKSIĆ, Ivan R. (ur.). *Professional Practice and Education in Geodesy and Geoinformatics: proceedings*, International Scientific Conference GEO 2016 and XXIX Meeting of Serbian Surveyors, 2-5 June 2016, Kopaonik, Serbia. Beograd: University, Faculty of Civil Engineering. 2016, str. 38-44.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                  |
|----------------------|----------------------------------|
| <b>Predmet:</b>      |                                  |
|                      | <b>GEODEZIJA V INŽENIRSTVU I</b> |
| <b>Course title:</b> |                                  |
|                      | <b>ENGINEERING SURVEY I</b>      |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 3. letnik | Zimski   |

Univerzitetna koda predmeta/University course code:

1349

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

Nosilec predmeta/Lecturer:

Božo Koler

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:

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Vsebina:

Content (Syllabus outline):

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| <b>Predavanja:</b> <ul style="list-style-type: none"> <li>Naloge geodezije v inženirstvu.</li> <li>Trendi v geodeziji v inženirstvu.</li> <li>Vrste geodetskih del pri gradnji objektov.</li> <li>Standardi v geodeziji v inženirstvu.</li> <li>Merska natančnost in dovoljena odstopanja.</li> <li>Merjenje in zakoličevanje dolžin.</li> <li>Merjenje in zakoličevanje kotov (vpliv pogreška centriranja na merjenje in zakoličevanje kotov).</li> <li>Metode zakoličevanja točk in analiza natančnosti, zakoličevanje vmesnih točk na osi, podaljševanje osi.</li> <li>Geodetska dela pri nizkih gradnjah.</li> </ul> | <b>Lectures:</b> <ul style="list-style-type: none"> <li>Tasks and trends in Engineering Surveying.</li> <li>Engineering Surveying for buildings construction.</li> <li>Standards in Engineering Surveying.</li> <li>Measurement accuracy and tolerance.</li> <li>Measurements/setting out off horizontal angles and distance, accuracy assessment of setting out horizontal angles and distance.</li> <li>Setting out procedures and accuracy assessment.</li> <li>Alignment of points on the axis, extension of axis.</li> </ul> |
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| <ul style="list-style-type: none"> <li>• Glavni elementi in zakoličevanje glavnih in detajlnih točk linijskega objekta.</li> <li>• Zakoličevanje višin. Računanje volumnov.</li> </ul> <p><b>Vaje:</b></p> <ul style="list-style-type: none"> <li>• Prenos višine skozi vertikalni jašek.</li> <li>• Precizni nivelman.</li> <li>• Določitev optimalnega števila stojišče določitve višinske razlike z metodo trigonometričnega višinomerstva.</li> <li>• Elaborat za zakoličevanje točk glavne zgradbe Jeklarna 2 (metode zakoličevanja točk in ocena natančnosti).</li> <li>• Uporaba programske opreme sodobnih elektronskih tahimetrov za potrebe geodezije v inženirstvu.</li> <li>• Stacioniranje linijskih objektov.</li> <li>• Računanje volumnov.</li> </ul> | <ul style="list-style-type: none"> <li>• Engineering surveying for design and construction of roads.</li> <li>• Geometry of circular curve and clotoide, setting out curve.</li> <li>• Setting out height of points Earthwork volumes.</li> </ul> <p><b>Tutorials:</b></p> <ul style="list-style-type: none"> <li>• Setting out height of points through a vertical shaft.</li> <li>• Precise levelling, accuracy assessment of trigonometric levelling.</li> <li>• Study of setting out main building of Jeklarna 2 (setting out procedures and accuracy assessment).</li> <li>• Use of total stations software for engineering surveying tasks, mile posting of the route, earthwork, volume calculation.</li> </ul> |
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**Temeljna literatura in viri/Readings:**

Bell, F. 1993: Surveying & Setting Out Procedures, Averbury, Aldershot, ZDA: 276 str.

Kavanagh, B. F. 2007: Surveying with Construction Applications, Sixt Edition, Pearson Prentice Hall, Upper Saddle River, ZDA: 671 str.

Moeser, M., Mueller, G., Schlemmer, H., Werner, H. 2000: Handbuch Ingeniergeodaesie, Grundlagen, 3. Voellig neubearbeitete und erweiterte Auflage, Herbert Wichman Verlag, Heidelberg, Nemčija: 642 str.

Schofield, W., Breach, M. 2007: Engineering Surveying, Sixth Edition, Elsevier, Oxford, GB: 622 str.

Uren, J., Price, W.F. 2006: Surveyng for engineers, 4th Edition, Palgrave Macmillan, Hampshire, GB: 824 str.

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

- študenti se seznaniijo z osnovnimi pojmi s področja geodezije v inženirstvu,
- seznaniijo se z nalogami in vlogo geodeta v različnih fazah izgradnje objekta,
- spoznajo zakoličevanje horizontalnih kotov, dolžin in višin,
- seznaniijo se z vplivi posameznih pogreškov, ki so prisotni pri zakoličevanju kotov, dolžin in višin,
- spoznajo različne metode zakoličevanja točk, zakoličevanja vmesnih točk na osi in podaljševanje osi,
- spoznajo, kako ocenimo natančnost zakoličevanja točk z različnimi metodami,
- seznaniijo se z glavnimi elementi, ki sestavljajo trase linijskih objektov in vlogo geodeta pri izgradnji linijskih objektov,
- spoznajo metode računanja volumnov zemeljskih mas linijskih in ploskovnih objektov.

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

- students became acquainted with the basic concept, tasks and significance of engineering surveying for buildings construction,
- they are introduced to setting out off horizontal angels, distance and height and the sources of errors,
- they became acquainted with setting out procedures, alignment of points on the axis and extension of axis and accuracy assessment,
- they are introduced to geometry of route and the role of surveyors in the construction routes
- they are introduced to methods of earthwork volume calculation (area/route).

**Competences:**

- recognize basic concept and tasks of engineering surveying,
- is capable to apply setting out procedures and accuracy assessment,
- know principles of volume calculations

|                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                 |
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| <ul style="list-style-type: none"> <li>• spoznavanje temeljnih vsebin in pojmov povezanih z geodezijo v inženirstvu,</li> <li>• poznati metode zakoličevanja točk in razumeti analizo natančnosti zakoličevanja točk,</li> <li>• poznati metode določevanja volumnov zemeljskih mas in</li> <li>• navajati študente na samostojno delo.</li> </ul> | <ul style="list-style-type: none"> <li>• is capable of use practical skills to manage, plan and perform engineering surveying tasks.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

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| <ul style="list-style-type: none"> <li>• Razume pomen in vlogo geodezije v inženirstvu pri izgradnji objektov in pri sodelovanju z drugimi strokami.</li> <li>• Pozna in razume razliko med metodami zakoličevanja objektov in analizami natančnosti zakoličevanja objektov.</li> <li>• Pozna posamezne elemente linijskih objektov in metode izračuna volumnov zemeljskih mas na osnovi geodetske izmere.</li> </ul> | <ul style="list-style-type: none"> <li>• Students understand the importance and role of engineering surveying for buildings construction and other professions.</li> <li>• They know and understand the difference between setting out procedures and accuracy assessments and are familiar with total stations software for engineering surveying tasks.</li> <li>• They understand the geometry of route and volumes calculation.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

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| Predavanja, seminarske in laboratorijske vaje, delo na terenu. | Lectures are ex-cathedra. Exercises are in the form of seminars, field work and computer classroom learning. |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                              |         |                                 |
|------------------------------|---------|---------------------------------|
| Pisni izpit (teoretičen del) | 70,00 % | Written exam (theoretical part) |
| Vaje                         | 30,00 % | Tutorials                       |

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

KOLER, Božo, SAVŠEK, Simona, AMBROŽIČ, Tomaž, STERLE, Oskar, STOPAR, Bojan, KOGOJ, Dušan. Realizacija geodezije v geotehniki = Realisation of geodesy in geotechnics. Geod. vestn.. [Tiskana izd.], 2010, letn. 54, št. 3, str. 450-468, ilustr., tabele. [http://www.geodetski-vestnik.com/54/3/gv54-3\\_450-468.pdf](http://www.geodetski-vestnik.com/54/3/gv54-3_450-468.pdf).

KOLER, Božo, MEDVED, Klemen, KUCHAR, Miran. The new fundamental gravimetric network of Slovenia. Acta geod. geophys. Hung., 2012, letn. 47, št. 3, str. 271-286, ilustr.

KOLER, Božo, URBANČIČ, Tilen, VIDMAR, Andrej, GLOBEVNIK, Lidija. Analiza višin poplavne vode v Ljubljani in na Ljubljanskem barju = Analysis of the flood in Ljubljana and on the Ljubljana moor. Geod. vestn. [Tiskana izd.], 2012, letn. 56, št. 4, str. 846-859.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                               |
|----------------------|-------------------------------|
| <b>Predmet:</b>      |                               |
|                      | <b>DALJINSKO ZAZNAVANJE I</b> |
| <b>Course title:</b> |                               |
|                      | <b>REMOTE SENSING I</b>       |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 3. letnik | Zimski   |

Univerzitetna koda predmeta/University course code:

1179

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

Nosilec predmeta/Lecturer:

Krištof Oštir

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:

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Vsebina:

Content (Syllabus outline):

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| <ul style="list-style-type: none"> <li>• Uvod v daljinsko zaznavanje: definicija in terminologija, zgodovinski razvoj, postopek,</li> <li>• fizikalne osnove daljinskega zaznavanja: elektromagnetno valovanje, elektromagnetni spekter, interakcija z atmosfero, interakcija s površjem, pasivni in aktivni senzorji,</li> <li>• podobe: definicija podobe, karakteristike podob,</li> <li>• denzorji daljinskega zaznavanja: na tleh, v zraku in vesolju, značilnosti satelitov, tirnice in pasovi,</li> <li>• ločljivost snemalnih sistemov: prostorska, spektralna, radiometrična in časovna ločljivost,</li> </ul> | <ul style="list-style-type: none"> <li>• Introduction to Remote Sensing: definition and terminology, historical development, process,</li> <li>• physical fundamentals of remote sensing: electromagnetic radiation, electromagnetic spectrum, the interaction with the atmosphere, interaction with the surface, passive and active sensors,</li> <li>• images: image definition, characteristics of images,</li> <li>• remote sensing sensors: ground, air and space, characteristics of satellites, orbits and swaths, spatial, spectral, radiometric and temporal resolution,</li> </ul> |
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| <ul style="list-style-type: none"> <li>• tehnike daljinskega zaznavanja: optično snemanje, večspektralno skeniranje, termično snemanje,</li> <li>• izbrani sateliti in senzorji,</li> <li>• radarski sistemi,</li> <li>• lasersko skeniranje,</li> <li>• sprejem podatkov, prenos in obdelava,</li> <li>• elementi za fotointerpretacijo,</li> <li>• digitalna obdelava podob - osnove: predobdelava, izboljšanje, transformacija in klasifikacija podob in</li> <li>• primeri uporabe.</li> </ul> | <ul style="list-style-type: none"> <li>• remote sensing techniques: optical imaging, multispectral scanning, thermal imaging,</li> <li>• selected satellites and sensors,</li> <li>• radar systems Laser scanning,</li> <li>• data receiving, transmission and processing Elements of photo interpretation,</li> <li>• digital image processing - the basics: pre-processing, enhancement, transformation and classification of images and</li> <li>• examples of use.</li> </ul> |
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**Temeljna literatura in viri/Readings:**

Campbell, J. B. 2002. Introduction to Remote Sensing, 3. izd. London: Taylor and Francis.

Mather, P.M. 2004. Computer Processing of Remotely Sensed Images: An Introduction, 3. izd. Chichester, John Wiley and Sons.

Oštir, K. 2006. Daljinsko zaznavanje. Ljubljana: Znanstvenoraziskovalni center SAZU.

Richard, J.A., Jia, X. 2006. Remote Sensing Digital Image Analysis: An Introduction, 4. izd. Berlin, Springer.

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

- študenti pridobijo osnovno znanje o daljinskem zaznavanju kot pomembnem viru podatkov o prostoru.

**Kompetence:**

- pridobijo dovolj znanja za samostojno uporabo tehnologije daljinskega zaznavanja v enostavnih aplikacijah opazovanja okolja,
- študenti spoznajo tehnike zajemanja podatkov iz različnih senzorjev na letalih in satelitih, načine interakcije valovanja z atmosfero in površjem in
- spoznajo način prenosa podatkov in enostavne postopke obdelave podob.

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

- the aim for students is to acquire basic knowledge about remote sensing as an important source of information about the space.

**Competences:**

- gain enough knowledge for independent use of remote sensing in simple applications of environmental monitoring.
- students learn the techniques of capturing data from various sensors on aircraft and satellites, methods of electromagnetic radiation interaction with the atmosphere and the surface and
- they learn about data transmission and the basic processing of images.

**Predvideni študijski rezultati:**

- Znanje in razumevanje osnov daljinskega zaznavanja in strokovne terminologije. Poudarek je na poznavanju satelitskih senzorjev. Razumejo potek procesa daljinskega zaznavanja po fazah.
- Poznavanje vrst virov daljinskega zaznavanja in njihovih značilnosti je pogoj za uporabo teh virov v praksi. Študenti se naučijo uporabljati enostavne tehnike obdelave podob in vizualno interpretirati podobe.

**Intended learning outcomes:**

- Knowledge and understanding of the basics of remote sensing and scientific terminology. The emphasis is on knowledge of satellite sensors. Understanding the remote sensing procedure in all stages.
- Knowledge of sources of remote sensing and their characteristics is a prerequisite for the use of those resources. Students learn to use basic techniques of image processing and interpreting visual images.

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| <ul style="list-style-type: none"> <li>Vsa teoretična poglavja se tesno povezujejo s praktičnimi primeri. Študenti se naučijo uporabljati teorijo v praksi, sposobni so se odločati in izbirati primerne metode in podatkovne vire za določeno uporabo.</li> <li>Študenti se naučijo povezovati znanje, iskati in uporabljati različne vire, samostojno obdelati strokovno temo.</li> </ul> | <ul style="list-style-type: none"> <li>All theoretical chapters are closely associated with practical examples. Students learn to apply theory in practice, they are able to make decisions and choose appropriate methods and data sources for a specific application.</li> <li>Students learn to integrate knowledge, to seek and use a variety of sources, and independently process a selected topic.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                                                                                                      |                                                                                                                  |
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| Predavanja: prosojnice, filmi, grafične ponazoritve, demonstracije, primeri iz prakse.<br><br>Praktične vaje: računalniška učilnica. | Lectures: slides, films, illustrations, demonstrations, case studies.<br><br>Practical exercises: computer room. |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                                    |         |                                                |
|------------------------------------|---------|------------------------------------------------|
| Naloge in sprotno delo (ocena vaj) | 40,00 % | Exercises and on-going work (graded exercises) |
| Pisni izpit (teoretičen del)       | 40,00 % | Written examination (theoretical part)         |
| Projekt (seminarska naloga)        | 10,00 % | Project (seminar)                              |
| Predstavitev seminarske naloge     | 10,00 % | Presentation of seminar paper                  |

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

LAMOVEC, Peter, VELJANOVSKI, Tatjana, MIKOŠ, Matjaž, OŠTIR, Krištof. Detecting flooded areas with machine learning techniques: case study of the Selška Sora river flash flood in September 2007. Journal of applied remote sensing, maj 2013, [Vol.] 7, [no.] 1, str. 1-13.

ZAKŠEK, Klemen, OŠTIR, Krištof. Downscaling land surface temperature for urban heat island diurnal cycle analysis. Remote sens. environ. [Print ed.], 2012, vol. 117, str. 114-124.

ZAKŠEK, Klemen, OŠTIR, Krištof, KOKALJ, Žiga. Sky-view factor as a relief visualization technique. Remote sens. (Basel). [Online ed.], 2011, 3, 2, str. 398-415.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                      |
|----------------------|----------------------|
| <b>Predmet:</b>      |                      |
|                      | <b>STVARNO PRAVO</b> |
| <b>Course title:</b> |                      |
|                      | <b>PROPERTY LAW</b>  |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 3. letnik | Zimski   |

|                                                            |         |
|------------------------------------------------------------|---------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 0033815 |
| <b>Koda učne enote na članici/UL Member course code:</b>   | 1688    |

| 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> | Gregor Dugar |
|-----------------------------------|--------------|

|                                    |                                     |
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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>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <ul style="list-style-type: none"> <li>Stvarno pravo, uvod v stvarno pravo, temeljna načela, temeljni pojmi.</li> <li>Pojem stvari javno dobro, premične in nepremične stvari, deljive in nedeljive stvari, stvari v prometu in izven njega, sestavine, pritikline in plodovi.</li> <li>Posest, pojem in pomen posesti, kriteriji razločevanja posesti od neposesti, pridobitev in izguba posesti, vrste posesti.</li> <li>Lastninska pravica, uvod, zgodovinski razvoj vsebine in pojma lastninske pravice, sosedsko pravo, večlastninska razmerja, pridobitev</li> </ul> | <ul style="list-style-type: none"> <li>Property law, introduction to property law, basic principles, basic concepts.</li> <li>Concept of property public good, movable and immovable matter, separable and inseparable matter, matter in traffic and outside it, elements, fixtures and fruits.</li> <li>Possession, criterion of distinction between possession and non-possession, acquisition and loss of possession, types of possession.</li> <li>Ownership right introduction, historic development of the contents and concept of ownership right, neighbor legal relationships,</li> </ul> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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| <p>lastninske pravice, prenehanje lastninske pravice, varstvo lastninske pravice.</p> <ul style="list-style-type: none"> <li>• Služnostna pravica.</li> <li>• Zastavna pravica.</li> <li>• Stvarna bremena.</li> <li>• Stavbna pravica.</li> <li>• Obligacijske pravice.</li> <li>• Zemljiška knjiga, zgodovinski razvoj, notranja ureditev, vrste vpisov in vpisovanje, načela zemljiškoknjižnega sistema, postopek vpisov v zemljiško knjigo, posebni zemljiškoknjižni postopki.</li> </ul> | <p>multi-ownership relations, acquisition of ownership right, cessation of ownership right, protection of ownership right.</p> <ul style="list-style-type: none"> <li>• Easement.</li> <li>• Lien.</li> <li>• Encumbrances.</li> <li>• Building right</li> <li>• Obligation rights.</li> <li>• Land registry, historic development, internal regulation, types of entries and registration, principles of land register system, procedures of entries in land register.</li> </ul> |
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**Temeljna literatura in viri/Readings:**

Plavšak, N. (avtor, urednik), Vrenčur, R. (avtor, urednik), Juhart, M., Bogataj, N., Dugar, G., Hrastnik, B., Napotnik, A., Orož, D., Podgoršek, B., Zorman Krč, M. 2020. Stvarno pravo: komentar Stvarnopravnega zakonika, 1. natis. Ljubljana, Tax-Fin-Lex, ABC Nepremičnine.

Juhart, M., Tratnik, M., Vrenčur, R., Plavšak, N., Geč, M. 2007. Stvarno pravo. GV založba. (predvsem v delu, ki obravnava nepremičnine / in particular chapters on real-estate)

Slovenska zakonodaja, pravilniki s področja obravnave: Uradni list RS. Dostopno na: <http://www.uradni-list.si>, [www.dz-rs.si](http://www.dz-rs.si), [www.pisrs.si/](http://www.pisrs.si/)

Gradiva odložena na spletno učilnico UL FGG / Other study material via the student web classroom.

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

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| <p><b>Cilja:</b></p> <ul style="list-style-type: none"> <li>• osnovni cilj predmeta je študenta na vsebinsko celovit način seznaniti z osnovami stvarnega prava, s poudarkom na pravni ureditvi nepremičnin,</li> <li>• študent pridobi naslednje kompetence: pozna osnove stvarnega prava in zemljiške knjige.</li> </ul> <p><b>Kompetenc&lt;:</b></p> <ul style="list-style-type: none"> <li>• nadaljnja uporaba znanja stvarnega prava omogoča študentu razumevanje pri praktičnem delu pri izpeljavi strokovnih geodetskih del pri evidentiranju nepremičnin in sodnih postopkih.</li> </ul> | <p><b>Objective:</b></p> <ul style="list-style-type: none"> <li>• the basic objective of the course is to introduce student the complete contents of basic property law, with the emphasis on legal system for real estate. Student acquires the following competences: knowledge of basic property law, and land register.</li> </ul> <p><b>Competence:</b></p> <ul style="list-style-type: none"> <li>• further use of knowledge on property law enables student to understand practical work related to the implementation of geodetic work in the sense of real estate recording and in legal procedures.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

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| <ul style="list-style-type: none"> <li>• Študent mora poznati osnove prava ter povezovati zakonodajo upravljanja z nepremičninami.</li> <li>• Poznati mora osnove zakonodaje o geodetski dejavnosti, poznavanje področja urejanja prostora, evidentiranja nepremičnin, varstva okolja ter gradnje objektov.</li> </ul> | <ul style="list-style-type: none"> <li>• Student must know the basics of law and connect legislation in the area of administration with real estate.</li> <li>• Student must know the basics of legislation related to geodetic activity, knowledge from the area of spatial planning, recording of real estate, environmental protection and construction.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

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| Predavanja, vaje teoretične, delno v računalniški učilnici. | Lectures, theoretical tutorials, partly in computer classroom. |
|-------------------------------------------------------------|----------------------------------------------------------------|

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

|                              |         |                                 |
|------------------------------|---------|---------------------------------|
| Pisni izpit (teoretičen del) | 80,00 % | Written exam (theoretical part) |
| Projekt (seminarska naloga)  | 20,00 % | Project (seminar work)          |

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

DROBNIG, Ulrich, BISPING, Christopher, BIZARRI, Luca, DUGAR, Gregor, et al., DROBNIG, Ulrich (urednik, avtor dodatnega besedila), BÖGER, Ole (urednik, avtor dodatnega besedila). *Proprietary security in movable assets : (PEL Prop. Sec.)*. Munich: Sellier European Law Publishers, cop. 2015. LVI, 934 str. Principles of European law, vol. 11. ISBN 978-3-935808-65-1, ISBN 978-3-86653-910-5. ISSN 1860-0905. <http://www.degruyter.com/viewbooktoc/product/129709>. [COBISS.SI-ID [4819243](#)]

DUGAR, Gregor. Die Kodifikationslage des slowenischen Zivil- und Wirtschaftsprivatrechts. *Jahrbuch für Ostrecht*. 2009, bd. 50, hb. 2, str. 389-414. ISSN 0075-2746. [COBISS.SI-ID [10397009](#)]

PLAVŠAK, Nina, DUGAR, Gregor, FURLAN, Mojca, JUHART, Miha, PODGORŠEK, Bojan, VRENČUR, Renato, ZABEL, Bojan, LUTMAN, Karmen, PROSTOR, Jerneja, REPAS, Martina, SRŠE, Dejan, VEBERČIČ, Jernej, PLAVŠAK, Nina (urednik). *Obligacije, posebni del : komentar posebnega dela Obligacijskega zakonika*. 1. natis. Ljubljana: Tax-Fin-Lex: Abc Nepremičnine, 2020-2021. 2 zv. (925; 729 str.), ilustr. E-paket. ISBN 978-961-94281-5-3, ISBN 978-961-94281-5-3. [COBISS.SI-ID [44682243](#)]

PLAVŠAK, Nina, VRENČUR, Renato, JUHART, Miha, DUGAR, Gregor, OROŽ, Damjan, PODGORŠEK, Bojan, PLAVŠAK, Nina (urednik), VRENČUR, Renato (urednik). *Komentar Stvarnopravnega zakonika. Knj. 3, Služnosti, stvarno breme, stavbna pravica in druge izvedene pravice*. 1. natis. Ljubljana: Planet GV: ABC Nepremičnine, 2020. 399 str., ilustr. Zbirka Sodobno stvarno pravo. ISBN 978-961-6941-21-1. [COBISS.SI-ID [14013699](#)]

PLAVŠAK, Nina (avtor, urednik), VRENČUR, Renato (avtor, urednik), JUHART, Miha, BOGATAJ, Nina, DUGAR, Gregor, HRASTNIK, Blaž, NAPOTNIK, Anita, OROŽ, Damjan, PODGORŠEK, Bojan, ZORMAN KRČ, Maja. *Stvarno pravo : komentar Stvarnopravnega zakonika*. 1. natis. Ljubljana: Tax-Fin-Lex: ABC Nepremičnine, 2020. 1188 str., ilustr. E-paket. ISBN 978-961-94281-3-9. [COBISS.SI-ID [26950659](#)]

DUGAR, Gregor. Maksimalna hipoteka v primerljivih pravnih redih. V: PLAVŠAK, Nina (ur.), et al. *[Komentar Stvarnopravnega zakonika. Knj. 2], Zastavna pravica*. 1. natis. Ljubljana: Planet GV: ABC Nepremičnine, 2018. Str. 136-138. Zbirka Sodobno stvarno pravo. ISBN 978-961-6941-13-6. [COBISS.SI-ID [16158033](#)]

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                            |
|----------------------|--------------------------------------------|
| <b>Predmet:</b>      |                                            |
|                      | <b>EVIDENCE IN KATASTRI NEPREMIČNIN</b>    |
| <b>Course title:</b> |                                            |
|                      | <b>REAL PROPERTY RECORDS AND CADASTRES</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 3. letnik | Letni    |

Univerzitetna koda predmeta/University course code:

1193

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 60         | 0       | 0    | 50            | 10                   | 120             | 8    |

Nosilec predmeta/Lecturer:

Anka Lisec

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:

|  |  |
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|  |  |
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Vsebina:

Content (Syllabus outline):

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| <ul style="list-style-type: none"> <li>Zemljiški informacijski sistemi ter njihova vloga v sistemu državne prostorske podatkovne infrastrukture,</li> <li>zgodovinski pregled razvoja zemljiških evidenc v svetu in pomen za družbo,</li> <li>razvoj zemljiškega katastra v Sloveniji (od prvih popisov zemljišč do stabilnega katastra: Franciscejski kataster, Reambulančni kataster),</li> <li>metode katastrske izmere in metode vzdrževanja stabilnega katastra (zakonodaja in standardi v 19. in 20. stoletju, vpliv na kakovost podatkov današnjega katastra),</li> </ul> | <ul style="list-style-type: none"> <li>Land information systems and their role in the system of state spatial data infrastructure,</li> <li>historical overview of land records at the international level and their importance for society,</li> <li>development of land cadastre in Slovenia (from the first records to stable cadastre: Franciscean cadastre, revised cadastre),</li> <li>methods of land surveying and maintenance of stable land cadastre (legislation and standards in the 19th and 20th centuries, the influence on data quality of current land cadastre),</li> </ul> |
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| <ul style="list-style-type: none"> <li>• sistem zemljiškega katastra in katastra stavb v Sloveniji po ZENDMPE in ZEN: vsebina in postopki v zemljiškem katastru in katastru stavb, katastrska klasifikacija.</li> <li>• katastrski načrti v Sloveniji - kakovost podatkov, vzdrževanje katastrskih načrtov. Sistem katastrov in njihova pravna vloga - povezava z zemljiško knjigo, temeljni pojmi s področja stvarnega prava,</li> <li>• kataster gospodarske javne infrastrukture - vsebina in postopki, posebnosti pri zajemu podatkov podzemnih vodov (nove tehnologije odkrivanja podzemnih vodov),</li> <li>• register prostorskih enot: evidenca državne meje, evidenca hišnih števil, druge temeljne prostorske enote v Sloveniji - vsebina in vzdrževanje evidenc,</li> <li>• koncepti in primeri vodenja podatkov o nepremičninah v svetu (parcelno orientirani sistemi, registracije listin),</li> <li>• standardi in trendi na področju zemljiške administracije in zemljiških informacijskih sistemov.</li> </ul> | <ul style="list-style-type: none"> <li>• the system of land and building cadasters in Slovenia according to the legislation: contents and procedures of land and building cadasters,</li> <li>• cadastral maps in Slovenia: data quality, maintenance of land cadastre. Systems of cadasters and their legal role – relation to the land registry, basic terms from the field of property law,</li> <li>• cadastre of public infrastructure – contents and procedures, specifics at acquisition of underground infrastructural objects (new technologies of detecting underground objects),</li> <li>• register of spatial units: records of state border, house numbers, other basic spatial records in Slovenia – contents and data maintenance of records,</li> <li>• concepts and study cases of real property records in foreign countries (parcel oriented systems, registration of titles),</li> <li>• standards and trends in the field of land administration and land information systems.</li> </ul> |
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#### Temeljna literatura in viri/Readings:

Dale, P.F., McLaughlin J.D. 1999. Land Administration. Oxford, Oxford University Press.

Ferlan, M., 2005. Geodetske evidence. Univerzitetni učbenik. Ljubljana, UL FGG.

ISO/DIS 19152. 2012. International Standard. Geographic information - Land administration domain model (LADM). Ženeva: ISO.

Kataster 2014, Mednarodna zveza geodetov FIG:

Larsson, G. 1991. Land Registration and Cadastral Systems: Tools of Land Information and Management. New York, Longman Scientific and Technical.

Ostala gradiva:

Lisec, A. Evidence in katastri nepremičnin. Ljubljana. Učno gradivo v spletni učilnici UL FGG.

Zakonodaja s področja obravnave.

#### Cilji in kompetence:

##### Cilji:

- razumevanje kompleksnosti sistemov zemljiške administracije, vključno z vplivom zgodovinskega razvoja na kakovost sedanjih sistemov,
- razumevanje osnovnih konceptov zemljiških oziroma nepremičninskih informacijskih sistemov kot pomembnega dela zemljiške administracije in njegovega pomena za družbo in družbeni razvoj,
- poznavanje strukture in procesov v zemljiških oziroma nepremičninskih informacijskih

#### Objectives and competences:

##### Objectives:

- understanding of complexity of land administration systems, including the influence of historical development on data quality of current systems,
- understanding of basic concepts of land or real property information system as an important part of land administration and the importance of those systems for society and its development,
- knowledge about structures and procedures in land or real property information systems in

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| <p>sistemih v Sloveniji (postopki zajemanja, spreminjanja, shranjevanja, prikazovanja in posredovanja podatkov, upravni postopki) in</p> <ul style="list-style-type: none"> <li>• razumevanje nepremičninskih informacijskih sistemov kot del prostorske podatkovne infrastrukture.</li> </ul> <p><b>Pridobljene kompetence:</b></p> <ul style="list-style-type: none"> <li>• poznavanje temeljnih vsebin in pojmov na področju zemljiške administracije ter zemljiških oziroma nepremičninskih informacijskih sistemov,</li> <li>• poznavanje in sposobnost izvajanja postopkov v sistemu zemljiške oziroma nepremičninske administracije v Sloveniji (zemljiški kataster, kataster stavb, zbirni kataster gospodarske javne infrastrukture, državna meja, register prostorskih enot, register nepremičnin),</li> <li>• poznavanje interdisciplinarnosti področja evidentiranja nepremičnin (zemljiške parcele, stavbe, gospodarska javna infrastruktura, temeljne prostorske enote, državna meja, imena ulic in hišne številke itd.) v povezavi s slovensko zakonodajo,</li> <li>• sposobnost za samostojno razumevanje vsebine in kakovosti nepremičninskih evidenc,</li> <li>• poznavanje vloge geodetske stroke pri reševanju pravnih vprašanj v povezavi s postopki evidentiranja nepremičnin in</li> <li>• razumevanje praktičnih primerov iz geodetske in prostorske prakse na področju evidentiranja nepremičnin in katastrskega preurejanja zemljišč.</li> </ul> | <p>Slovenia (data acquisition, recording and saving of changes, data visualization and distribution, administrative procedures) and</p> <ul style="list-style-type: none"> <li>• understanding of real property information Systems as part of spatial data infrastructure.</li> </ul> <p><b>Competences:</b></p> <ul style="list-style-type: none"> <li>• basic knowledge and understanding of basic terms in the field of land administration and land or real property information systems,</li> <li>• familiarity with and the ability of implementing procedures in the system of land or real property administration in Slovenia (land cadastre, building cadastre, cadastre of public infrastructure, state border records, register of spatial units, real property registry),</li> <li>• familiarity with the interdisciplinarity of the field of real property recording (land plots, buildings, public utility network, basic spatial units, state border, street systems and house numbers, etc.) in connection to the Slovenian legislation,</li> <li>• ability of autonomous understanding of contents and quality of real property records,</li> <li>• familiarity with the role of surveying profession at solving of legal problems in connection to procedures of real property recording and</li> <li>• understanding of real world cases from the surveying and spatial planning practice in the field of real property recording as well as of cadastral land rearrangements.</li> </ul> |
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**Predvideni študijski rezultati:**

- Seznanitev s strokovno terminologijo, osnove razumevanja področja.
- Razlikovanje med različnimi sistemi evidentiranja nepremičnin v svetu, poznavanje standardov in trendov.
- Poznavanje sistemov evidentiranja nepremičnin v Sloveniji - statični (vsebina) in dinamični (postopki) vidik: zemljiški kataster, kataster stavb, zemljiška knjiga, ZK gospodarske javne infrastrukture, register prostorskih enot, evidenca hišnih števil.
- Razumevanje kakovosti podatkov nepremičninskih evidenc, sposobnost usklajevanja podatkov različnih kakovosti pri opravljanju geodetskih storitev ter pri drugih dejavnostih, kjer se uporabljajo ti podatki.
- Poznavanje postopkov evidentiranja nepremičnin, razumevanje vloge geodeta pri delu s strankami.

**Intended learning outcomes:**

- Getting knowledge on professional terminology, basic knowledge in the field.
- Understanding of differences between systems of real property recording from different countries, knowledge of standards and trends.
- Getting knowledge on systems of real property recording in Slovenia - static (contents) and dynamic (procedures) aspects: land cadastre, building cadastre, land registry, cadastre of public infrastructure, register of spatial units, register of house numbers.
- Ability to understand data quality of real property records, data harmonization ability of harmonizing data of different qualities at executing of surveying services as well as other activities, where real property data are used.
- Getting knowledge on procedures of real property recording, understanding the role of surveyor working with customers; understanding and ability of using complex

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| <ul style="list-style-type: none"> <li>Razumevanje in sposobnost uporabe kompleksne programske opreme, ki je potrebna pri vsakodnevnih opravilih v praksi.</li> </ul> | computer software, which is needed at everyday work in practice. |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                                                                                                                                                                               |                                                                                                                                                                                                             |
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| Predavanja, vaje - v računalniški učilnici, delo z geodetskimi programskimi orodji, laboratorijske vaje, priprava in obdelava podatkov za terensko delo, terenske vaje - terenska izmera in vodenje postopka. | Lectures, tutorials using surveying computer software; laboratory work – preparation and data processing for field measurements; field exercises – field measurements and execution of cadastral procedure. |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                        |         |                                          |
|------------------------|---------|------------------------------------------|
| Terensko delo          | 20,00 % | Field work                               |
| Naloge in sprotno delo | 20,00 % | Exercises and collaboration at tutorials |
| Pisni izpit            | 60,00 % | Written exam                             |

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

ČEH, Marjan, GIELSDORF, Frank, LISEC, Anka, 2011. Homogenization of digital cadastre index map improving geometrical quality. V: Zadnik Stirn, Lidija (ur.), Žerovnik, Janez (ur.), Povh, Janez (ur.), Drobne, Samo (ur.), Liseč, Anka (ur.). SOR '11 proceedings. Ljubljana: Slovenian Society Informatika, Section for Operational Research, 2011, str. 53-59.

LISEC, Anka, PIŠEK, Jernej, DROBNE, Samo, 2013. Suitability analysis of land use records of agricultural and forest land for detecting land use change on the case of the Pomurska Statistical Region. Acta geogr. Slov., 53(1), 70-90, doi: 10.3986/AGS53104.

LISEC, Anka, FERLAN, Miran, LOBNIK, Franc, ŠUMRADA, Radoš, 2008. Modelling the rural land transaction procedure. Land use policy, 25(2), 286-297, doi: 10.1016/j.landusepol.2007.08.003.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                               |
|----------------------|-----------------------------------------------|
| <b>Predmet:</b>      |                                               |
|                      | <b>UPRAVLJANJE IN VREDNOTENJE NEPREMIČNIN</b> |
| <b>Course title:</b> |                                               |
|                      | <b>REAL ESTATE MANAGEMENT AND VALUATION</b>   |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik    | Semestri |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 3. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1197 |
|------------------------------------------------------------|------|

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

|                                   |                     |
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| <b>Nosilec predmeta/Lecturer:</b> | Maruška Šubic-Kovač |
|-----------------------------------|---------------------|

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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>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <ul style="list-style-type: none"> <li>Temeljni pojmi na področju upravljanja in vrednotenja nepremičnin in statistične podlage vrednotenja nepremičnin.</li> <li>Razvoj nepremičnin in življenjski cikel nepremičnin.</li> <li>Značilnosti trga nepremičnin, transparentnost trga nepremičnin. Sistem tržnega vrednotenja nepremičnin: predmet ocenjevanja, ocenjevana vrednost in načini ocenjevanja vrednosti: pristop primerjave, donosa in stroškov ter posamezne metode vrednotenja.</li> <li>Posamično vrednotenje nepremičnin, mednarodni, evropski in slovenski standardi</li> </ul> | <ul style="list-style-type: none"> <li>Basic definitions in the field of real estate valuation and real estate management, statistical basis for real estate valuation.</li> <li>Real estate development and life cycle.</li> <li>Characteristics of real estate market, transparency of real estate market. System of market real estate valuation: valuation subject, value and approaches: direct sales comparison approach, income approach and cost approach.</li> <li>Other specific real estate valuation approaches, international, European and Slovenian valuation standards.</li> </ul> |

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| <p>ocenjevanja vrednosti nepremičnin, izdelava analize cen nepremičnin na izbranem območju.</p> <ul style="list-style-type: none"> <li>• Množično vrednotenje nepremičnin, pravne podlage, pridobivanje podatkov, modeli vrednotenja, praktični primeri.</li> <li>• Organizacija posamičnega in množičnega vrednotenja nepremičnin. Organizacija posredovanja in vrednotenja nepremičnin.</li> <li>• Etika na področju vrednotenja nepremičnin. Pridobivanje potrebnih zemljišč za gradnjo: pravni posel, odločbe državnega organa.</li> <li>• Opremljanje zemljišč za gradnjo. Od gradbenega dovoljenja do uporabnega dovoljenja in vpisa v uradne evidence.</li> <li>• Upravljanje nepremičnin države in občine. Najemna razmerja. Upravljanje večstanovanjskih stavb.</li> <li>• Ekonomski in finančni vidiki urejanja in uporabe stavbnih zemljišč; nadomestila, prispevki, davki, odškodnine, vezani na nepremičnine.</li> <li>• Zasebno-javno partnerstvo na področju nepremičnin.</li> <li>• Razvoj nepremičnin.</li> </ul> | <ul style="list-style-type: none"> <li>• Mass valuation of real estates, legal bases, data acquisition, valuation models.</li> <li>• Organization of individual and mass real estate valuation.</li> <li>• Organization of real estate brokerage.</li> <li>• Real estate valuation ethics.</li> <li>• Acquisition and development of building land.</li> <li>• From building permit to registration in official records.</li> <li>• State and municipal real estate managements.</li> <li>• Renting. Housing management.</li> <li>• Economic and financial aspects of building land development and use, fees, taxes and compensation linked to real estate.</li> <li>• Private-public partnership in the field of building land development.</li> <li>• Real estate development and facility management.</li> </ul> |
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#### Temeljna literatura in viri/Readings:

Mednarodni standardi ocenjevanja vrednosti. 2011. International Valuation Standards Committee, IVSC. Slovenski poslovnofinančni standard 2, UL RS št. 54/2005.

Petersen, H. 2005. Marktorientierte Immobilienbewertung, Richard Boorberg Verlag, 85 str.

Šubic Kovač, M. 2013. Upravljanje in vrednotenje nepremičnin, Študijsko gradivo, UL FGG, Ljubljana, 232 str.

Šubic Kovač, M., Weiss, E. 2008. Urejanje stavbnih zemljišč v Zvezni Republiki Nemčiji, UL FGG, 159 str.

Drieheaus, H.-J. Erschließungs und Ausbaubeiträge. München, C. H. Beck Verlag, izbrana poglavja, 71 str.,

Gondring, H., Lammel, E. 2001. Handbuch Immobilienwirtschaft, Gabler, 1215 str.

#### Cilji in kompetence:

##### Cilji:

- cilj predmeta je seznaniti študenta s področjem upravljanja z nepremičninami, še posebej s področjem vrednotenja nepremičnin,
- poznavanje in razumevanje izrazoslovja s področja upravljanja in vrednotenja nepremičnin ter znanj s področja prostorskega planiranja, stvarnega prava in gradnje inženirskih objektov, pomembnih za področje upravljanja in vrednotenja nepremičnin,
- razumevanje in uporaba procesov in načinov posamičnega in množičnega vrednotenja nepremičnin ter obvladovanje postopkov, ki so potrebni od sprejetja prostorskega akta do vpisa nepremičnine v uradne evidence,
- seznanjenost z zakonodajo in standardi na področju vrednotenja nepremičnin in

#### Objectives and competences:

##### Objectives:

- to familiarize student with real estate management, especially with real estate valuation,
- to know and understand the terminology in the field of real estate management and real estate valuation,
- the ability to use basic knowledge in the field of real estate management and valuation,
- to get familiar with spatial planning, property law and civil engineering in the context of real estate management and valuation,
- ability to use various methods of individual real estate valuation and mass real estate valuation,
- knowledge regarding procedures needed for registration of real estate in official records and

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| <p>obvladovanje pridobivanja in analiziranja podatkov o trgu nepremičnin ter prilagajanja novim situacijam pri razvoju stroke.</p> <p><b>Kompetence:</b></p> <ul style="list-style-type: none"> <li>• sposobnost uporabe temeljnega znanja s področja upravljanja in vrednotenja nepremičnin ter povezovanje tega znanja z drugimi področji geodezije,</li> <li>• sposobnost za reševanje konkretnih problemov pri delu z uporabo znanstvenih metod in postopkov in</li> <li>• sposobnost umeščanja novih informacij in interpretacij v kontekst upravljanja in vrednotenja nepremičnin.</li> </ul> | <ul style="list-style-type: none"> <li>• to get familiar with legislation and standards in the field of real estate valuation.</li> </ul> <p><b>Competences:</b></p> <ul style="list-style-type: none"> <li>• ability to acquire and analyze data regarding real estate market,</li> <li>• ability to adjust to changed conditions in the field of real estate valuation and</li> <li>• to apply the obtained knowledge in connection with other courses in the field of geodesy.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

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| <ul style="list-style-type: none"> <li>• Študent spozna in razume bistvene karakteristike pojma nepremičnine, še posebej stavbnega zemljišča in razlike, ki delijo stavbno od kmetijskega zemljišča.</li> <li>• Pridobi znanje o načinih vrednotenja nepremičnin in jih zna uporabiti v praksi ter pri razvoju stroke.</li> </ul> | <ul style="list-style-type: none"> <li>• Student is familiar with basic characteristics of real estate with the emphasis on the building land and its differences with regard to agricultural land.</li> <li>• Student acquires knowledge about various methods of real estate valuation and knows how to use them in practice and in development of the profession.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

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| Predavanja z uporabo vizualnih pripomočkov, izdelava samostojnega elaborata s pomočjo javno dostopnih podatkov in z uporabo računalniških programov. | Lectures using visual aids; consultations when making individual seminar project using computer programs and publicly available data. |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                              |         |                                 |
|------------------------------|---------|---------------------------------|
| Naloge in sprotno delo       | 10,00 % | Coursework                      |
| Pisni izpit (teoretičen del) | 60,00 % | Written exam (theoretical part) |
| Projekt (seminarska naloga)  | 30,00 % | Seminar project                 |

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

RAKAR, Albin, ČERNE, Tomaž, ŠUBIC KOVAČ, Maruška. Fiskalna in usmerjevalna vloga javnih dajatev pri izvajanju aktivne zemljiške politike = Fiscal and guiding role of public duties in land policy implementation. Geod. vestn. [Tiskana izd.], 2008, letn. 52, št. 4, str. 743-757, ilustr. [http://www.geodetski-vestnik.com/52/4/gv52-4\\_743-757.pdf](http://www.geodetski-vestnik.com/52/4/gv52-4_743-757.pdf). [COBISS.SI-ID 4410977]

ŠUBIC KOVAČ, Maruška, WEIß, Erich. Modeli urejanja stavbnih zemljišč v Zvezni republiki Nemčiji. Ljubljana: Fakulteta za gradbeništvo in geodezijo, Institut za komunalno gospodarstvo, 2008. 159 str., ilustr. ISBN 978-961-6167-62-8.

ŠUBIC KOVAČ, Maruška. Land Development Potential under Conditions of Sustainable Development in the Republic of Slovenia. V: HEPERLE, Erwin (ur.). Land Management: Potential, Problems and Stumbling

Blocks. Zürich: VDF Hochschulverlag AG an der ETH, 2013, str. 177-185. Dostopno na:  
[http://www.vdf.ethz.ch/service/3479/3480\\_Landmanagement\\_OA.pdf](http://www.vdf.ethz.ch/service/3479/3480_Landmanagement_OA.pdf).

## 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 |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 3. letnik | Letni    |

|                                                            |         |
|------------------------------------------------------------|---------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 0033818 |
| <b>Koda učne enote na članici/UL Member course code:</b>   | 1199    |

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 6          | 0       | 0    | 0             | 80                   | 34              | 4    |

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|-----------------------------------|------------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Matevž Dolenc, Simona Savšek |
|-----------------------------------|------------------------------|

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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>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <ul style="list-style-type: none"> <li>Študent se seznani in opravlja delo, ki ga opravlja diplomant tega študija v praksi,</li> <li>poudarek je na izdelavi geodetskega načrta,</li> <li>izvedba geodetsko-tehničnih del pri graditvi manj zahtevnih objektov, izvedba manj zahtevnih zemljiško-katastrskih geodetsko-tehničnih del,</li> <li>izvajanje manj zahtevnih geodetsko-tehničnih del v okviru osnovnega geodetskega sistema in vzdrževanje baz geodetskih podatkov. Izdelava kartografskih podlag in prikazov za potrebe načrtovanja posegov v prostor.</li> </ul> | <ul style="list-style-type: none"> <li>Student is introduced to and performs work done by graduates in the professional work,</li> <li>elaboration of detailed topographic map,</li> <li>implementation of surveying-technical works in the process of constructing less complex objects,</li> <li>implementation of less demanding land cadastre surveying-technical works,</li> <li>implementation of less demanding geodetic-technical works in the context of geodetic control,</li> <li>maintenance of geodetic data databases,</li> </ul> |

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|  | <ul style="list-style-type: none"> <li>elaboration of cartographic maps for the purpose of urban and spatial planning.</li> </ul> |
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**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.

Resources are selected in collaboration with the supervisor of practical training in relation to the contents prescribed and disposed of by the organization conducting the practical training.

- Interna in druga gradiva v delovni organizaciji.
- Smernice za praktično usposabljanje na Univerzi v Ljubljani, Ljubljana, september 2007, [https://kakovost.uni-lj.si/wp-content/uploads/2020/10/Smernice\\_prakticno\\_usposabljanje-1.pdf](https://kakovost.uni-lj.si/wp-content/uploads/2020/10/Smernice_prakticno_usposabljanje-1.pdf)
- Govekar, Okoliš et.al. 2010. Praktično usposabljanje študentov v delovnih organizacijah in primeri dobrih praks. Ljubljana, UL FF, Center za pedagoško izobraževanje.
- Matjaž Mikoš, Samo Jaklič, Andreja Istenič Starčič, "STATISTIČNO-DEMOGRAFSKA ANALIZA PRAKTIKANTOV ŠTUDENTOV GEODEZIJE V SLOVENIJI V OBDOBJU 2008-2011", Geodetski vestnik, Letnik 56 (2012), št. 3, [http://www.geodetski-vestnik.com/56/3/gv56-3\\_513-533.pdf](http://www.geodetski-vestnik.com/56/3/gv56-3_513-533.pdf)
- Andreja Istenič Starčič, Nejc Ogrič, Žiga Turk, "POGLED NA ŠTUDIJSKI PROCES SKOZI ANALIZO PRAKTIČNEGA USPOSABLJANJA", Gradbeni vestnik, nov 2015, <https://www.zveza-dgits.si/gradbeni-vestnik-nov-2015/>
- Andreja Istenič Starčič, Matjaž Mikoš, "DELOVNI MENTORJI ŠTUDENTOM UL FGG: POVEZOVALNI ČLEN MED AKADEMSKIM IN DELOVNIM OKOLJEM", Gradbeni vestnik, april 2019, <https://www.zveza-dgits.si/gradbeni-vestnik-apr-2019/>

Učno gradivo v spletni učilnici UL FGG.

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

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| <b>Cilji:</b> <ul style="list-style-type: none"> <li>študent spozna operativno delo v ciljnih poklicih, organizacijsko strukturo subjektov na področju geodezije,</li> <li>študent se vključuje v delo javne geodetske službe na državni ali lokalni ravni, v delo geodetskih podjetij, lahko pa tudi v raziskovalnih ali izobraževalnih inštitucijah.</li> <li>pod mentorstvom iz vrst zaposlenih izdela samostojno nalogo,</li> <li>praksa, izvedena med izobraževalnim procesom, ima tudi motivacijski cilj ter namen – razvoj kompetenc za povezovanje teorije in dela v praksi,</li> <li>študent spozna dejavnike kariernega načrtovanja in razvoja in procese povezane s kariernim razvojem.</li> <li>študentu se omogoči samoevalvacijo kompetenc in dejavnikov, ki podpirajo procese poklicne identifikacije v povezavi akademskega okolja in geodetskih delovnih okolij.</li> <li>študent spozna značilnosti učenja na delovnem mestu in značilnosti delovnih okolij ter značilnosti opazovanja in registriranja delovnih procesov.</li> </ul> <b>Kompetenca:</b> | <b>Objectives:</b> <ul style="list-style-type: none"> <li>the aim of the trainee programme is for students to learn about the operational work in targeted occupations, the organizational structure of entities in the field of geodetic engineering,</li> <li>student participates in the work of public survey service at the state or the local level, in the work of surveying companies, but also in research or educational institutions,</li> <li>under supervision of the staff the trainee elaborates a separate task,</li> <li>practice made during the educational process also has a motivational goal and purpose the development of competences for the integration of theory and work in practice,</li> <li>students learn about the elements of career planning and development and the processes related to career development,</li> <li>students are facilitated self-assessment of competences and factors that support the processes of professional identification in the context of academic environment and surveying work environments and</li> <li>students learn about the characteristics of workplace learning and work environment</li> </ul> |
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| <ul style="list-style-type: none"> <li>• uporaba in prenos teoretičnih znanj, ki jih študent pridobi tekom študija pri predavanjih, vajah ter terenskem pouku v geodetsko prakso.</li> </ul> | <p>characteristics and features of observation and registration workflows.</p> <p><b>Competence:</b></p> <ul style="list-style-type: none"> <li>• use and transfer of theoretical knowledge acquired by student during the study in surveying practice.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| <ul style="list-style-type: none"> <li>• Študent pridobi praktična znanja in izkušnje na področju nalog in storitev geodetske stroke.</li> <li>• Prenos in uporaba znanj študijskih predmetov v delovnem okolju praktičnega usposabljanja.</li> <li>• Študent zna ovrednotiti svoje delo glede na zastavljene in dosežene cilje. Strokovno delo reflektira na osnovi zbranih informacij.</li> <li>• Študent razvija kompetence za načrtovanje lastne kariere in samoevalvacijo znanja in kompetenc.</li> </ul> | <ul style="list-style-type: none"> <li>• Students will acquire practical knowledge and experience in the field of tasks and services of surveying profession.</li> <li>• The transfer and use of knowledge of courses in the workplace of practical training.</li> <li>• Student is able to evaluate work against the objectives and targets achieved. Professional work is reflected on the basis of the information collected.</li> <li>• Student develops skills for planning own career and self- assessment of skills and competencies.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                                                                         |                                                                                                                               |
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| Terensko delo, mentorstvo, demonstracije, konzultacije, pisanje poročila PU in vodenje dnevnika prakse. | Field work, mentorship, demonstrations, tutoring, consulting, writing a PT report and diary management of practical training. |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                                                                                                                                                   |          |                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Poročilo o PU, ki vključuje življenjepis, motivacijsko pismo, dnevnik prakse in samoevalvacijo kompetenc. NI ŠTEVILČNE OCENE; OPRAVIL/NI OPRAVIL. | 100,00 % | PT report, which includes a CV, motivation letter, diary of practical work and self-evaluation of competencies. NO NUMERICAL MARK; PASS/DID NOT PASS. |
|---------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------|

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

KLINC, Robert, DOLENC, Matevž. BIMpogovori: podcast o informacijskem modeliranju zgradb in informacijsko-komunikacijskih tehnologijah v gradbeništvu = BIMpogovori : podcast about building information modelling and information and communication technologies in architecture, engineering and construction in water engineering. Gradbeni vestnik: glasilo Zveze društev gradbenih inženirjev in tehnikov Slovenije. [Tiskana izd.]. jan. 2018, letn. 67, str. 11-15, ilustr. ISSN 0017-2774. [COBISS.SI-ID 8301921]

DOLENC, Matevž, KLINC, Robert. Podcast BIMpogovori: podcast v katerem se Matevž in Robert z gosti sproščeno pogovarjata o informacijskem modeliranju zgradb (BIM) in informacijsko-komunikacijskih tehnologijah. Ljubljana: [s. n.], 2016. BIMpogovori. <http://bimpogovori.si>. [COBISS.SI-ID 8242017]

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]

DOLENC, Matevž. Professional Scrum Muster I. 2015. <https://www.credly.com/badges/7cbda98c-b958-493a-9eb8-598041646407>

SAVŠEK, Simona. Dobrega inženirja ni mogoče izobraziti čez noč - vlaganje v kadre na daljši rok bi dosegli tudi z aktivnejšo štipendijsko politiko ter pripravo razpisov za prakso in pripravništvo: kolumna - izobraževanje. *Mineral & gradnja*. 2021, št. 2, str. 62, fotogr. ISSN 2670-6946. <https://www.mineral-revija.si/>.

SAVŠEK, Simona, AMBROŽIČ, Tomaž, MARJETIČ, Aleš, KREGAR, Klemen, ŠTEBE, Gašper, KOLER, Božo, GORŠIČ, Janez. *76. izmera HC Formin in jezovne zgradbe v Markovcih : geodetska izmera horizontalnih in vertikalnih premikov geodetskih točk*. Ljubljana: Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo, Katedra za geodezijo, 2021. 29 str., [11] pril., barvne ilustr.

STERLE, Oskar, PAVLOVČIČ PREŠEREN, Polona, KUCHAR, Miran, RITLOP, Klemen, MARJETIČ, Aleš, KREGAR, Klemen, ŠTEBE, Gašper, AMBROŽIČ, Tomaž, SAVŠEK, Simona, KOGOJ, Dušan. *Tehnično poročilo izvedbe geodetske izmere portalnih mrež in izračun koordinat točk v izbranem koordinatnem sistemu 2TDK*. Ljubljana: Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo, Katedra za geodezijo, 2021. 173 str., ilustr.

SAVŠEK, Simona, FLERIN, Matjaž, KREGAR, Klemen, KOGOJ, Dušan. Geodetska izmera fasad stavb za namen energetske sanacije = Geodetic evaluation of building facades for the purpose of energy renovation. *Geodetski vestnik: glasilo Zveze geodetov Slovenije*. [Tiskana izd.]. 2018, letn. 62, št. 2, str. 201-217, ilustr. ISSN 0351-0271. [http://geodetski-vestnik.com/62/2/gv62-2\\_savsek.pdf](http://geodetski-vestnik.com/62/2/gv62-2_savsek.pdf), DOI: [10.15292/geodetski-vestnik.2018.02.201-217](https://doi.org/10.15292/geodetski-vestnik.2018.02.201-217)

## 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 |
|----------------------------------------------------------|---------------------------------|-----------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) | 3. letnik | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1692 |
|------------------------------------------------------------|------|

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

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

|                                    |                                            |
|------------------------------------|--------------------------------------------|
| <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>                                                                                                        |
| Tema in mentor, ki sta jih odobrila Študijski odbor Oddelka za geodezijo, skladno s Pravilnikom o študiju na I. in II. Stopnji. | Approved topic and mentor by the Study Board of the Geodetic Department according to the Rules of 1st and 2nd cycle studies. |

|                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                       | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                           |
| <p>Diplomsko delo se izdelava pod mentorstvom izbranega učitelja. Delo se javno predstavi ob zaključku študija. Vsebovati mora:</p> <ul style="list-style-type: none"> <li>• uvod,</li> <li>• delovno hipotezo,</li> <li>• pregled virov,</li> <li>• material in metode,</li> <li>• rezultate,</li> <li>• razpravo in</li> <li>• povzetek.</li> </ul> | <p>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:</p> <ul style="list-style-type: none"> <li>• Introduction,</li> <li>• Working hypothesis,</li> <li>• Overview of sources,</li> <li>• Material and methods</li> <li>• Results,</li> <li>• Discussion,</li> <li>• Summary.</li> </ul> |

|                                                                                                                                                                |                                                                                                                                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Praviloma se v nalogi obravnavajo praktični problemi iz geodetske prakse in podajajo rešitve, do katerih pridejo s pomočjo študija in izsledkov lastnega dela. | The diploma thesis ordinarily deals with practical geodetic problems and should provide further solutions which come out from the study and from the results of student's own work. |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**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, Ljubljana, UL FGG, 2011, 39 strani, priloge. Dostopno na:

[http://www3.fgg.uni-lj.si/fileadmin/user\\_upload/UL\\_FGG -  
Pr 10 Navodila za oblikovanje visokosolskih del na UL FGG 2011 07.pdf](http://www3.fgg.uni-lj.si/fileadmin/user_upload/UL_FGG_-_Pr_10_Navodila_za_oblikovanje_visokosolskih_del_na_UL_FGG_2011_07.pdf)

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:****Cilji:**

- študent uporabi pridobljena znanja v poglobljeni študiji na temi diplomskega dela,
- pod mentorstvom izdela koncept naloge v kateri so opredeljeni namen, cilji, metode in viri za izdelavo naloge,
- zaznavanje samostojnega, kritičnega in etičnega načina dela in
- z javno predstavitvijo naloge pridobiva komunikacijske spretnosti in sposobnosti.

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

- students use the knowledge gained in an in-depth study on the topic of the thesis,
- student prepares a concept, where the purposes, goals, methods and references for the thesis are presented,
- the aim is to develop independent, critical and ethical way of working and
- from public presentation student obtains communication skills and abilities.

**Predvideni študijski rezultati:**

- Pridobi znanja v vseh fazah, ki so del samostojnega reševanja konkretnih problemov in nalog na področju geodezije in geoinformatike, sodelovanje in tudi timskega dela v okviru različnih subjektov iz področja geodezije.
- Razume geodezijo in geoinformatiko kot interdisciplinarni panogi.

**Intended learning outcomes:**

- students acquire knowledge in all phases, which are part of an independent problem in geodesy and geoinformation as well as cooperation and teamwork within the various entities in geodesy and
- they understand geodesy and geoinformation as an interdisciplinary field.

**Metode poučevanja in učenja:**

Samostojno delo, konzultacije

**Learning and teaching methods:**

Independent work and consultations.

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

|                          |         |                                           |
|--------------------------|---------|-------------------------------------------|
| Delo in izdelana naloga  | 50,00 % | Work on the topic and written thesis Oral |
| Ustna javna predstavitev | 50,00 % | presentation of the topic                 |

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

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                      |
|----------------------|----------------------|
| <b>Predmet:</b>      |                      |
|                      | <b>TERENSKO DELO</b> |
| <b>Course title:</b> |                      |
|                      | <b>FIELD WORK</b>    |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik | Semestri |
|----------------------------------------------------------|---------------------------------|--------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) |        | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1201 |
|------------------------------------------------------------|------|

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

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

|                                    |                                          |
|------------------------------------|------------------------------------------|
| <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> |
|                                                                              |                       |

|                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                   | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                           |
| <ul style="list-style-type: none"> <li>Vzpostavitev koordinatne osnove delovišča,</li> <li>rekognosciranje terena,</li> <li>planiranje izmere,</li> <li>izvedba izmere,</li> <li>vrednotenje kakovosti izmere na osnovi klasičnih ter satelitsko podprtih metod izmere v nalogah urejanja nepremičnin.</li> </ul> | <ul style="list-style-type: none"> <li>Establishment of the basic coordinate of the measurement area,</li> <li>researching of the terrain,</li> <li>planning of the surveying,</li> <li>surveying procedure,</li> <li>evaluation of the quality of the measurements based on classical and satellite-based methods of surveying in order to regulate real estate.</li> </ul> |

**Temeljna literatura in viri/Readings:**

Kahmen, H. 1993. Vermessungskunde 18.izd., izbrana poglavja. Berlin New York, de Gruyter.

KontiĆ S. 1971. Geodezija. Beograd Privredni pregled, Beograd.

Mihailović, K., Vračarić, K. 1984. Geodezija I., izbrana poglavja. Beograd, Naučna knjiga.

Macarol, S. 1985. Praktična geodezija, izbrana poglavja. Zagreb, Tehnička knjiga.

Zupančič, P. 1984. Geodezija za gradbene tehnike. Ljubljana, TZS.

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

- študenti spoznajo praktično delo geodeta na različnih področjih,
- spoznajo sintezno reševanje geodetskih strokovnih nalog ter njihovo umestitev v postopkih urejanja nepremičnin.

**Kompetence:**

- je sposoben uporabiti in povezovati znanja vseh faz dela na področju geodetske izmere za potrebe urejanja nepremičnin,
- zna uporabiti osvojeno znanje pri vrednotenju kakovosti pridobljenih rezultatov za potrebe geodetske izmere, geodezije v inženirstvu in urejanja nepremičnin in
- zna praktično uporabiti osnovna znanja o pridobivanju prostorskih podatkov za potrebe urejanja nepremičnin ter ta znanja ustrezno nadgraditi.

**Objectives:**

- students learn about the practical work of surveyors in different areas,
- they learn about synthesis of solving geodetic professional tasks and their placement in the procedures regulating real estate.

**Competences:**

- apply and integrate the knowledge of all phases of work in the field of land surveying for the purpose of regulating real estate,
- apply the acquired knowledge in evaluating the quality of the results obtained for the purpose of land surveying, geodesy in engineering and regulation of real estate and
- practically apply the basic knowledge on the acquisition of spatial data for the purpose of regulating the real estate and upgrade this knowledge appropriately.

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

- Študentje spoznajo področja delovanja geodeta v nalogah urejanja nepremičnin, tako s strani izvajalca kot s strani uporabnika.
- Spoznajo in razumejo tehnične, administrativne, upravne in pravne postopke pri urejanju nepremičnin.

- Students learn about the scope of the surveyor editing tasks in regulation of real estate from the point of view of the contractor and of the user.
- They recognize and understand the technical, administrative, and legal procedures in the regulation of real estate.

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

Terensko delo, mentorstvo, demonstracije, konzultacije.

Field work, mentoring, demonstrations, consultations.

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

Delo, izdelana naloga, oddano projektno gradivo

60,00 %

Field work, written paper.

Pisni in ustni zagovor.

40,00 %

Written and oral presentation.

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

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                             |
|----------------------|-----------------------------|
| <b>Predmet:</b>      |                             |
|                      | <b>PROGRAMIRANJE</b>        |
| <b>Course title:</b> |                             |
|                      | <b>COMPUTER PROGRAMMING</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik | Semestri      |
|----------------------------------------------------------|---------------------------------|--------|---------------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) |        | Letni, Zimski |

Univerzitetna koda predmeta/University course code:

1202

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 15         | 0       | 45   | 0             | 0                    | 60              | 4    |

Nosilec predmeta/Lecturer:

Krištof Oštir, Matevž Dolenc

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:

|  |  |
|--|--|
|  |  |
|--|--|

Vsebina:

Content (Syllabus outline):

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Pregled vsebine predmeta, izrazoslovje in izbrana literatura,</li> <li>kaj je programiranje in zakaj programiramo,</li> <li>programiranje brez računalnika,</li> <li>programski jeziki,</li> <li>uvod v algoritme,</li> <li>programski jezik Python,</li> <li>spremenljivke – tipi podatkov, pretvorbe,</li> <li>branje in pisanje podatkov – besedilne datoteke, XML, podatkovne baze,</li> <li>odločitve in zanke – if, for, while,</li> <li>funkcije in podprogrami,</li> <li>odpravljanje napak,</li> </ul> | <ul style="list-style-type: none"> <li>Overview of course content, terminology and literature,</li> <li>what is programming, why to program,</li> <li>programming without a computer,</li> <li>programming languages,</li> <li>introduction to algorithms,</li> <li>programming language Python,</li> <li>variables – types, data conversion,</li> <li>reading and writing of data - text files, XML, databases,</li> <li>conditional statements and loops - if, for, while,</li> <li>functions and routines,</li> <li>debugging,</li> </ul> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• zasnova kompleksnih rešitev,</li> <li>• spremljanje verzij in skupinski razvoj,</li> <li>• osnove GitHuba,</li> <li>• R in statistične analize in</li> <li>• avtomatizacija postopkov – QGIS/ArcGIS.</li> </ul> <p><b>Vaje:</b></p> <ul style="list-style-type: none"> <li>• razvoj programa za reševanje izbranega geodetskega inženirskega problema. Zasnova algoritmov, programiranje, testiranje, objava, prikaz delovanja.</li> </ul> | <ul style="list-style-type: none"> <li>• the design of complex solutions,</li> <li>• version tracking and group development,</li> <li>• GitHub basics,</li> <li>• R and statistical analysis,</li> <li>• Process automation – QGIS/ArcGIS.</li> </ul> <p><b>Exercises:</b></p> <ul style="list-style-type: none"> <li>• the development of a program for solving the selected geodetic engineering problem. The design of algorithms, programming, testing, publishing, and demonstration of functionality.</li> </ul> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Temeljna literatura in viri/Readings:**

Graser, A. Learning QGIS. 2014. Birmingham: Packt Publishing.

Lawhead, J. 2015. QGIS Python Programming Cookbook. Birmingham: Packt Publishing

Lutz, M. 2013. Learning Python, O'Reilly Media.

Mueller, John. Beginning Programming with Python for Dummies. John Wiley & Sons, 2014.

Python Software Foundation. 2014. Python Documentation. <https://docs.python.org/3/>

Stellman, A., Greene, J. 2015. Learning Agile, O'reilly Media.

**Cilji in kompetence:**

- Poglobljeno znanje izbranega programskega jezika.
- Samostojna zasnova in implementacija inženirskih programov za različne naprave.
- Osnovno znanje različnih metod in orodij razvoja programske opreme.

**Objectives and competences:**

- Advanced knowledge of the selected programming language.
- Design and development of engineering applications for different devices.
- Basic knowledge of software development methods and tools.

**Predvideni študijski rezultati:**

- Poglobljeno znanje in razumevanje inženirskih problemov.
- Reševanje problemov s pomočjo sodobnih informacijskih tehnologij.
- Razumevanje informacijskih tehnologij in njihov vpliv na družbo in delovno okolje.

**Intended learning outcomes:**

- In-depth knowledge and understanding of engineering problems.
- Using information technology for providing solutions to engineering problems.
- Understanding of information technologies and their impact on society and working environment.

**Metode poučevanja in učenja:**

Predavanja v predavalnici, uporaba sodobnih metod poučevanja (grafične ponazoritve, demonstracije, primeri iz prakse).

Laboratorijske vaje po podanih gradivih in samostojna projektna naloga.

**Learning and teaching methods:**

Lectures in classroom with modern IT equipment (graphical presentations, demonstration, practical cases).

Guided and prepared exercises in computer lab and individual project.

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

|                  |         |               |
|------------------|---------|---------------|
| Projektna naloga | 80,00 % | Project work  |
| Sprotno delo     | 20,00 % | Participation |

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

DOLENC, Matevž, KATRANUSCHKOV, Peter, GEHRE, Alexander, KUROWSKI, Krzysztof, TURK, Žiga. The IntelliGrid platform for virtual organisations interoperability. Journal of information technology in construction, ISSN 1874-4753, 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. Journal of information technology in construction, ISSN 1874-4753, 2009, letn. 14, pos. št., str. 473-488.

MARSETIČ, Aleš, OŠTIR, Krištof, KOSMATIN FRAS, Mojca. Automatic orthorectification of high-resolution optical satellite images using vector roads. IEEE transactions on geoscience and remote sensing, ISSN 0196-2892. [Print ed.], 2015, vol. 53, iss. 11, str. 6035-6047, doi: 10.1109/TGRS.2015.2431434.

PEHANI, Peter, ČOTAR, Klemen, MARSETIČ, Aleš, ZALETELJ, Janez, OŠTIR, Krištof. Automatic geometric processing for very high resolution optical satellite data based on vector roads and orthophotos. Remote sensing, ISSN 2072-4292. [Online ed.], 2016, vol. 8, iss. 4, ilustr. <http://www.mdpi.com/2072-4292/8/4/343>, doi: 10.3390/rs8040343.

PERUŠ, Iztok, KLINC, Robert, DOLENC, Matevž, DOLŠEK, Matjaž. A web-based methodology for the rediction of approximate IDA curves. Earthquake engineering & structural dynamics, ISSN 0098-8847. [Print ed.], 2012, letn. 41, št. , str. 1-18. , ilustr., doi: 10.1002/eqe.2192

ZAKŠEK, Klemen, OŠTIR, Krištof. Downscaling land surface temperature for urban heat island diurnal cycle analysis. Remote sensing of environment, ISSN 0034-4257. [Print ed.], 2012, vol. 117, str. 114-124, ilustr., doi:10.1016/j.rse.2011.05.027

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                             |
|----------------------|---------------------------------------------|
| <b>Predmet:</b>      |                                             |
|                      | <b>STANDARDI V GEODEZIJI IN INŽENIRSTVU</b> |
| <b>Course title:</b> |                                             |
|                      | <b>STANDARDS IN GEODESY AND ENGINEERING</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik | Semestri      |
|----------------------------------------------------------|---------------------------------|--------|---------------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) |        | Letni, Zimski |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1208 |
|------------------------------------------------------------|------|

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

|                                   |                                                      |
|-----------------------------------|------------------------------------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Božo Koler, Polona Pavlovčič Prešeren, Simona Savšek |
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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>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Predavanja:</b> <ul style="list-style-type: none"> <li>Mednarodni standardi (ISO), evropski standardi (CEN), nemški standardi (DIN). Slovenski inštitut za standardizacijo (SIST) Slovenski inštitut za kakovost in meroslovje (SIQ) Urad RS za meroslovje (MIRS).</li> <li>Sistem standardizacije v Sloveniji (terminologija, označevanje, normativni dokumenti).</li> <li>Stopnje standardizacije (simplifikacija, specifikacija, standardizacija). Skladnost tehnične zakonodaje s standardiziranimi postopki.</li> </ul> | <b>Lectures:</b> <ul style="list-style-type: none"> <li>International standards (ISO), European standards (CEN), German standards (DIN). Slovenian Institute for Standardization (SIST). Metrology Institute of the Republic of Slovenia (MIRS). Standardization system in Slovenia (terminology, normative documents).</li> <li>Types of standardization (simplification, specification, standardization).</li> <li>Compliance of technical regulations with standardized procedures.</li> <li>Optimal degree of order in the form of rules and regulations.</li> </ul> |

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| <ul style="list-style-type: none"> <li>• Optimalna stopnja urejenosti v obliki pravil in določil.</li> <li>• Kalibracijski in preizkusni laboratoriji (kriteriji za delovanje preizkusnih laboratorijev, akreditacija).</li> <li>• Pravne podlage (Zakon o standardizaciji, Uredba o postopkih notificiranja na področju standardov, tehničnih predpisov in postopkov za ugotavljanje skladnosti,</li> <li>• Zakon o meroslovju, Pravilnik o nacionalnih etalonih, Pravilnik o merilnih instrumentih).</li> <li>• Standardi ISO in DIN za geodetski instrumentarij: pomembnejši standardi za preizkus merilnih instrumentov z namenom ugotavljanja praktične natančnosti in zagotavljanja optimalne natančnosti meritev.</li> <li>• Standardi služb IAG/IUGG kot deli konvencij, standardi IERS.</li> <li>• Zakonska ureditev GNSS frekvenčnega spektra.</li> <li>• Industrijski standardi izmenljivosti podatkov med različnimi tipi instrumentov (NMEA 0183 and 2000). Standardi pretoka podatkov (RTCM SC 104), NTRIP.</li> </ul> <p><b>Vaje:</b></p> <ul style="list-style-type: none"> <li>• Standardizirani postopki določitve natančnosti geodetskih instrumentov po ISO 17123.</li> </ul> | <ul style="list-style-type: none"> <li>• Calibration and testing laboratories (operation criteria, accreditation).</li> <li>• Legal basis (Standardization Act, Technical regulations and conformity assessment procedures, Metrology Act, Rules of national standards, Rules of measuring instruments).</li> <li>• ISO and DIN standards for geodetic equipment: Important standards for testing of measuring equipment to determine the practical accuracy and to ensure optimal measuring accuracy.</li> <li>• IAG/IUGG standard as a part of conventions, IERS standards.</li> <li>• GNSS specifications and standards for instruments, regularization of GNSS spectrum.</li> <li>• Industrial standards for exchangeability of data between GNSS and other devices (NMEA 0183 and NMEA 2000). Standards for real-time data flow (RTCM SC 104), NTRIP.</li> </ul> <p><b>Tutorials:</b></p> <ul style="list-style-type: none"> <li>• Standardized methods of precision determination for different geodetic instruments according to the procedures of ISO 17123 standards.</li> </ul> |
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### Temeljna literatura in viri/Readings:

Heister, H. 2008. The new ISO standard 17123-8 for checking GNSS field measuring systems. FIG delovni teden 2008, Stockholm, Švedska.

Mednarodni standard ISO 17123-8 2007. Optics and optical instruments – Field procedures for testing geodetic and surveying instruments.

Pavlovčič Prešeren, P., Mencin, A., Stopar, B. 2010. Analiza preizkusa instrumentarija GNSS-RTK po navodilih standarda ISO 17123-8. Geodetski vestnik, DOI: 10.15292/geodetski-vestnik.2010.04.607-626

Zakon o meroslovju (uradno prečiščeno besedilo) (ZMer-1-UPB1). Uradni list RS št. 26/2005.

### Cilji in kompetence:

#### Cilji:

- študentje razumejo pomen standardizacije geodetskih merskih postopkov in merske opreme,
- poznajo sistem standardizacije v Sloveniji ter skladnost tehnične zakonodaje s standardiziranimi postopki,
- dobijo znanja iz obstoječe zakonodaje in izrazoslovja iz standardizacije,
- na komparatorskih bazah ugotavljajo instrumentalne in geometrične ekscentricitete in znajo rezultate ovrednotiti,

### Objectives and competences:

#### Objectives:

- students understand the importance of standardization of geodetic measurement processes and measuring equipment,
- they learn how the standardization system in Slovenia as well as the consistency of technical legislation with standardized procedures works,
- they obtain knowledge of existing legislation and understand the terminology in the field of standardization,
- on the comparator platforms they learn how to identify instrumental and geometric eccentricity and how to evaluate the results,

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| <ul style="list-style-type: none"> <li>• pridobijo podrobnejši vpogled v protokole izmenljivosti podatkov med instrumenti GNSS in povezavo le-teh z drugimi instrumenti,</li> <li>• dobijo znanja pretoka GNSS-opazovanj v realnem času z namenom izračuna položaja objekta v realnem času,</li> <li>• praktične izkušnje dobijo pri reševanju primerov iz prakse v simuliranih in naravnih okoljih in</li> <li>• svoja znanja umestijo kot uporabna za izvajanje zahtevnejših inženirskih del.</li> </ul> <p><b>Kompetence:</b></p> <ul style="list-style-type: none"> <li>• nadgradnja teoretičnih znanj s praktičnim spoznavanjem standardiziranih postopkov za geodetsko opremo (elektronski tahimeter, nivelir, GNSS RTK-instrument),</li> <li>• znajo določiti točnost/natančnost geodetske merske opreme po specifičnem standardu in</li> <li>• samostojno delo študentov.</li> </ul> | <ul style="list-style-type: none"> <li>• they gain detailed insight into the protocol of GNSS data flow as well as exchangeability of data between different types of geodetic instruments,</li> <li>• they acquire knowledge of data flow of GNSS observations in real-time with the aim of real-time position calculation,</li> <li>• practical experiences are obtained by solving case studies in simulated and natural environments and</li> <li>• their experiences can be further implemented as useful knowledge for solving complex engineering tasks.</li> </ul> <p><b>Competences:</b></p> <ul style="list-style-type: none"> <li>• to upgrade the theoretical knowledge with practical knowledge of standardized procedures for surveying equipment (electronic total station, levels, GNSS RTK-instrument),</li> <li>• ability to determine the accuracy/precision of geodetic measuring equipment according to the specific standard and</li> <li>• accustoming students to independent work.</li> </ul> |
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**Predvideni študijski rezultati:**

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| <ul style="list-style-type: none"> <li>• Študentje spoznajo mednarodne standarde (ISO), evropske standarde (CEN) in nemške standarde (DIN).</li> <li>• Spoznajo kompetence Slovenskega inštituta za kakovost in meroslovje (MIRS).</li> <li>• Razumejo skladnost tehnične zakonodaje s standardiziranimi postopki ter spoznajo kalibracijske in preizkusne laboratorije.</li> <li>• Znanje oplemenitijo s poznavanjem pravnih podlag (zakonov, uredb in pravilnikov) s področja standardizacije specialno za geodetske merske postopke in opremo.</li> <li>• Naučijo se pomembnejših teoretičnih standardiziranih postopkov (ISO) za geodetske instrumente.</li> <li>• Pridobijo specifična znanja o določitvi koordinat in izmerah v realnem času, ki temeljijo na uporabi standardnih protokolov zapisa in pretoka opazovanj.</li> <li>• Spoznajo možnost vzpostavitve izmenljivosti podatkov opazovanj (v času ali naknadno) med geodetskimi instrumenti kot tudi v kombinaciji geodetskih instrumentov z drugimi navigacijskimi instrumenti.</li> </ul> | <p><b>Intended learning outcomes:</b></p> <ul style="list-style-type: none"> <li>• Students become familiar with international standards (ISO), European standards (CEN) and German standards (DIN).</li> <li>• They understand the competences of the Slovenian Institute of Quality and Metrology (SIQ) as well as the Office for Metrology of the Republic of Slovenia (MIRS).</li> <li>• They understand the technical compliance of legislation with standardized procedures and gather knowledge about calibration and testing laboratories.</li> <li>• They enrich their knowledge by learning about legal processes (laws, decrees and regulations) in the field of standardization for the geodetic measurement procedures as well as for the equipment.</li> <li>• They learn how to use major theoretical standardized procedures (ISO) for geodetic instruments.</li> <li>• They acquire specific knowledge about the determination of the coordinates in real-time, based on standardized protocols for GNSS-data flow usage.</li> <li>• They understand different possibilities of interchangeability establishment for different types of data or observations (in real-time or for post-processing), which is related to the geodetic instruments as well as to the combination of the geodetic and non-geodetic instruments (for example navigation instruments).</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

Predavanja (četrtina ur v okviru predmeta) potekajo v obliki ex-katedra z uporabo sodobnih učnih pripomočkov, grafičnih prikazov, demonstracij in primerov iz prakse.

Praktične vaje (polovica ur v okviru predmeta) potekajo v obliki praktičnih vaj na terenu in v računalniški učilnici. Izbira tematike in izdelava seminarja (četrtina ur v okviru predmeta) poteka na osnovi izbrane teme iz nabora, ki jo podajo izvajalci predmeta.

Lectures (one quarter of the course) are ex-cathedra using different teaching aids, as for example graphics, demonstrations and practical examples.

Practical tutorials (one half of the course) take the form of practical exercises in the field and in the computer lab. The choice of topics and prepared presentations (the last quarter of the course) are based on selected topics from the list of themes, given by the lecturers.

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

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|-------------------------------------|---------|---------------------------------|
| Seminar (zapisano in predstavljeno) | 20,00 % | Seminar (written and presented) |
| Vaje                                | 20,00 % | Tutorials                       |
| Pisni izpit (teoretičen del)        | 60,00 % | Written (theoretical part)      |

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

KOLER, Božo, SAVŠEK, Simona, AMBROŽIČ, Tomaž, STERLE, Oskar, STOPAR, Bojan, KOGOJ, Dušan. Realizacija geodezije v geotehniki = Realisation of geodesy in geotechnics. Geod. vestn. [Tiskana izd.], 2010, letn. 54, št. 3, str. 450-468, ilustr., tabele. [http://www.geodetski-vestnik.com/54/3/gv54-3\\_450-468.pdf](http://www.geodetski-vestnik.com/54/3/gv54-3_450-468.pdf). [COBISS.SI-ID 5121889]

KOLER, Božo, URBANČIČ, Tilen, VIDMAR, Andrej, GLOBEVNIK, Lidija. Analiza višin poplavne vode v Ljubljani in na Ljubljanskem barju = Analysis of the flood in Ljubljana and on the Ljubljana moor. Geod. vestn. [Tiskana izd.], 2012, letn. 56, št. 4, str. 846-859.

MAZIĆ, Edin, TUNO, Nedim, SAVŠEK, Simona, KOGOJ, Dušan. Optimalna dolžina vizure digitalnega nivelirja Leica geosystems DNA03 = Optimal sighting distance of alLeica geo-systems DNA03 digital level. Geod. vestn. [Tiskana izd.], 2013, letn. 57, št. 2, str. 233-244, ilustr. [COBISS.SI-ID 6284897].

PAVLOVČIČ PREŠEREN, Polona, STOPAR, Bojan. Wavelet Neural Network employmnet for continuous GNSS orbit function construction: Application for the Assisted - GNSS principle. Applied soft computing, 2013, letn. 13, št. 5, str. 2526-2536.

PAVLOVČIČ PREŠEREN, Polona, MENCIN, Albin, STOPAR, Bojan. Analiza preizkusa instrumentarija GNSS- RTK po navodilih standarda ISO 17123-8 = Analisys of GNSS-RTK instruments testing on the ISO 17123- 8. Geod. vestn., 2010, letn. 54, št. 4, str. 607-626.

PAVLOVČIČ PREŠEREN, Polona, STOPAR, Bojan. Izračun položaja GPS-satelita iz podatkov preciznih efemerid = GPS- orbit computation from precise ephemeris data. Geod. vestn. [Tiskana izd.], 2005, letn. 49, št. 2, str. 177-190.

SAVŠEK, Simona. Pomen testiranja hipotez v deformacijski analizi = The significance of hypothesis testing in deformation analysis. Geod. vestn. [Tiskana izd.], 2013, letn. 57, št. 3, str. 465-478, ilustr. [COBISS.SI-ID 6343521].

SAVŠEK, Simona, GREGORN, Zoran, AMBROŽIČ, Tomaž. Measuring meteorological data along the ray path of a distance meter with an ultra-light aircraft. Surv. rev. - Dir. Overseas Surv., 2013, letn. 45, št. 328, str. 3-12, ilustr. [COBISS.SI-ID 6136673].

STOPAR, Bojan, KOLER, Božo, KOGOJ, Dušan, STERLE, Oskar, AMBROŽIČ, Tomaž, SAVŠEK-SAFIĆ, Simona, KUHAR, Miran, RADOVAN, Dalibor. Geodetska dela na novi mareografski postaji Koper = Geodetic activities at the new tide gauge station Koper. Geod. vestn., 2006, letn. 50, št. 4, str. 609-619.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                   |
|----------------------|-----------------------------------|
| <b>Predmet:</b>      |                                   |
|                      | <b>HIDROGRAFIJA IN TOPONOMIJA</b> |
| <b>Course title:</b> |                                   |
|                      | <b>HIDROGRPAHY AND TOPONOMY</b>   |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik | Semestri      |
|----------------------------------------------------------|---------------------------------|--------|---------------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) |        | Letni, Zimski |

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| <b>Univerzitetna koda predmeta/University course code:</b> | 1621 |
|------------------------------------------------------------|------|

| 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> | Dušan Petrovič |
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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>                                                                   |
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| Pogoj za pristop k predmetu je osnovno znanje splošne kartografije (vsaj 4 ECTS). | To apply to the course basic knowledge in general cartography (min 4 ECTS) is required. |

| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                |
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| <ul style="list-style-type: none"> <li>Vloga in pomen hidrografije in pomorske kartografije,</li> <li>mednarodna določila, standardizacija, IHO in IMO,</li> <li>topografska in hidrografska izmera in merski sistemi,</li> <li>nivoji morske gladine,</li> <li>obdelava hidrografskih podatkov, redukcija meritev, generalizacija in hidrografski originali,</li> <li>objekti za navigacijo,</li> <li>pomorske karte, njihove lastnosti in zahteve, matematični elementi, metode in načini prikaza,</li> </ul> | <ul style="list-style-type: none"> <li>Importance of hydrography and marine cartography,</li> <li>international standardization and rules, IHO and IMO,</li> <li>topographic and hydrographic survey and measuring systems,</li> <li>sea levels,</li> <li>managing hydrographic data, reduction, generalization and hydrographic basemap,</li> <li>navigation objects,</li> </ul> |

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| <ul style="list-style-type: none"> <li>• izdelava pomorskih kart in uporaba,</li> <li>• navtični vodniki in druge pomorske publikacije,</li> <li>• opis in uporaba ENC in ECDIS,</li> <li>• vloga in pomen toponomije,</li> <li>• usmeritve OZN,</li> <li>• osnovni pojmi, večjezičnost, eksonimi, endonimi,</li> <li>• kategorizacija geografskih imen,</li> <li>• standardizacija in nacionalni imeniki,</li> <li>• uporaba in prikazovanje zemljepisnih imen na kartah.</li> </ul> | <ul style="list-style-type: none"> <li>• nautical charts, geodetic elements, methods and design, nautical chart production and use, nautical guides and other publications</li> <li>• ENC and ECDIS; importance of toponymy,</li> <li>• UN guidelines, basic terms, multilingual, exonyms, endonyms, categorization of geographical names,</li> <li>• standardization and national gazetteers,</li> <li>• use and presentation of geographical names on maps.</li> </ul> |
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**Temeljna literatura in viri/Readings:**

Jong, 2002. Hydrography. Delft.

Klanjšček, M., Radovan, D. 2005. Navtični vodnik Slovenskega morja. Ljubljana.

Navtični vodnik. Dostopno na: <http://www.hidrografija.si/index.php> , <http://www.hidrografija.si> , <http://www.ihp.int/srv1/>

Radovan, D. 1995. Toponimska navodila za Slovenijo. Ljubljana

Robinson et al. 2002. Elements of Cartography.

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

- predmet sestavlja dve ločeni vsebini: cilj prvega dela je, da študenti spoznajo osnovna načela hidrografije kot vede o opisovanju in prikazovanju topografije morske obale in priobalnega pasu, pomembnega za potrebe plovbe in drugih dejavnosti v tem prostoru ter zakonitosti obdelave hidrografskih podatkov,
- drugi del predmeta študenta seznani s pomenom in problematiko zemljepisnih imen, njihovim poreklom, standardizacijo, klasifikacijo in pravili za uporabo ter prikazovanje na kartah.

**Kompetenci:**

- poznavanje in razumevanje hidrografije in toponomije,
- sposobnost pojasnjevanja in uporabe baz podatkov in kart, ki vsebujejo hidrografske podatke ter zemljepisna imena.

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

- the course consists of two separated parts: the aim of the first part is to familiarize students with basic principles of hydrography as a science and its meaning for recording and visualizing topography of sea coastline and coastal area, important for sea shipping, yachting and other activities,
- the second part familiarizes students with the meaning and importance of geographical names, their origins, standardization, classification and rules for their use and presentation on maps.

**Competences:**

- understanding importance and meaning of hydrography and toponymy,
- capability of understanding and interpreting databases and maps, which includes hydrographic data and geographical names.

**Predvideni študijski rezultati:**

- Znanje in razumevanje osnovnih strokovnih pojmov, zakonitosti in postopkov, zakonodajnih osnov in stopnje standardizacije področja.

**Intended learning outcomes:**

- Knowledge and understanding of the basic professional terms, knowledge and procedures, legislations and standardization in both fields.

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| <ul style="list-style-type: none"> <li>• Sposobnost pojasnjevanja in uporabe baz podatkov in kart, ki vsebujejo hidrografske podatke ter zemljepisna imena.</li> <li>• Študenti se navajajo na povezovanje izredno širokega spektra s kartografijo povezljivih naravoslovnih, družboslovnih in tehničnih znanosti, ki so potrebne za sintezno razumevanje kartografije.</li> </ul> | <ul style="list-style-type: none"> <li>• Capability of understanding and interpreting databases and maps, which includes hydrographic data and geographical names.</li> <li>• Students get familiar with wide aspect of different disciplines connected with cartography: natural, social or technical, which are important for synthetic understanding of cartography</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

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| <p>Predavanja: v predavalnici, uporaba sodobnih metod poučevanja (grafične ponazoritve, demonstracije, primeri iz prakse).</p> <p>Praktične vaje: izvedba v predavalnici, problemsko reševanje, ogledi in obiski, izvedba projekta v računalniški učilnici v majhnih skupinah pod vodstvom in ob usmerjanju pedagoga</p> | <p>Lectures in classroom with modern IT equipment (graphical presentations, demonstration, practical cases).</p> <p>Practical work: in classroom, problem solving, site visits, map creation in computer classroom in small groups under supervision of lecturer.</p> |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

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| Teoretični izpit (ustni)      | 50,00 % | Theoretical exam (oral, partly written) |
| Sprotno delo pri vajah        | 30,00 % | Continuous work at tutorials            |
| Projektna (seminarska) naloga | 15,00 % | Project (seminar) work                  |
| Terenska vaja, obiski         | 5,00 %  | Terrain exercise, visits                |

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

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
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| <p>BERK, Sandi, RADOVAN, Dalibor, PETROVIČ, Dušan. The problems of scale and standardization in the toponymic database. V: BAČIĆ, Željko (ur.). Geoinformation for practice: proceedings of the ISPRS WG VI/3 workshop, 15th to 18th october 2003, Zagreb, Croatia,</p> <p>BORISOV, Mirko, BERK, Sandi, RADOVAN, Dalibor, PETROVIČ, Dušan. Modeli izgradnje baze geografskih naziva. Geod. ž., 2010, letn. 8, št. 42, str. 20-22</p> <p>RADOVAN, Dalibor, KARNIČNIK, Igor, PETROVIČ, Dušan. Hidrografske podatki slovenskega morja in elektronska pomorska kartografija. V: HLADNIK, David (ur.), KREVS, Marko (ur.), PERKO, Drago (ur.), PODOBNIKAR, Tomaž (ur.), STANČIČ, Zoran (ur.). Geografski informacijski sistemi v Sloveniji 1999-2000</p> |
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## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                             |
|----------------------|---------------------------------------------|
| <b>Predmet:</b>      |                                             |
|                      | <b>MERJENJE IN OPISOVANJE PROSTORA</b>      |
| <b>Course title:</b> |                                             |
|                      | <b>MEASUREMENT AND DESCRIPTION OF SPACE</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik | Semestri      |
|----------------------------------------------------------|---------------------------------|--------|---------------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) |        | Letni, Zimski |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1622 |
|------------------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 30         | 0       | 20   | 0             | 10                   | 60              | 4    |

|                                   |                           |
|-----------------------------------|---------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Polona Pavlovčič Prešeren |
|-----------------------------------|---------------------------|

|                                    |                                   |
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| <b>Vrsta predmeta/Course type:</b> | Izbirni spopšni /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>                                                                                                                                                                                                                                   |
| Predmet je namenjen študentom drugih študijskih programov, predvsem s področja družboslovja. Zanje ni pogojev pristopa, ne more pa ga izbrati študent kateregakoli študijskega programa, ki je v svojem študijskem programu imel vsebine geodezije. | The course is intended to students of other study programs, mainly those from social sciences; no accession conditions are foreseen, but it cannot be selected by students from study programs that include contents from geodesy, i.e. land surveying. |

|                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                          | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                         |
| <b>Predavanja:</b> <ul style="list-style-type: none"> <li>vloga in pomen prostora: kaj je prostor, vrste rabe prostora, dejavnosti v prostoru, javni in zasebni prostor, javno dobro, omejitve v prostoru, pravni režimi in varstveni pasovi, varovanje prostora, vrednotenje prostora, načrtovanje prostora,</li> </ul> | <b>Lectures:</b> <ul style="list-style-type: none"> <li>the role and importance of space: what is space, types of spatial use, activities in space, public and private space, public good, limitations in space, legal regimes and protection zones, protection of space, valuation of space, spatial planning,</li> </ul> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• prostorski podatki: opisovanje prostora, vrste podatkov (geometrični, opisni; rastrski, vektorski), vloga in pomen koordinatnega sistema, koordinatni sistemi v Sloveniji, metode zajema, terestrično klasično merjenje, GNSS merjenje, množični zajem z daljinskim zaznavanjem, pomen fotogrametrije, geodetski načrt, topografski podatki: aeroposnetki, ortofoto, karte, topografske baze (DMR, REZI...); geodetski podatki: zemljiški kataster, katasterstavb, ZK GJI, RPE, REN; podatki rabe tal in GERK, podatki pravnih režimov, Atlas okolja, PIS občin, spletni atlasi in globusi (Google zemlja), kakovost podatkov in</li> <li>• vloga geodeta in geodezije v družbi: obravnavanje mej, načrtovanje posegov v prostor, prenos projekta v naravo, vrednotenje nepremičnin, zemljiške operacije, spremljanje pomikov, določanje oblike in velikosti Zemlje, lokacijske storitve, izdelava kart, vzpostavitev 3D modelov terena ali objektov.</li> </ul> <p><b>Vaje:</b></p> <p>Na izbranem območju prikazati načine in tehnike od pridobivanja podatkov (ogled delovanja osnovnih merskih instrumentov, Interpretacija satelitskega posnetka, uporaba osnovnih podatkovnih evidenc) do umestitve posega v prostor (ogled dela geodeta na terenu) ter tako omogočiti razumevanje posameznih teoretičnih sklopov in s tem procesov v prostoru.</p> | <ul style="list-style-type: none"> <li>• spatial data: description of space, types of data (geometric, descriptive; raster, vector data), role and importance of coordinate system, coordinate systems in Slovenia, data acquisition methods, terrestrial measurements, GNSS measurements, remote sensing for mass data collection, importance of photogrammetry, land surveying plan, topographic data: aerial photographs, orthophoto, maps, topographic databases (digital relief model, register of geographical names, etc.); land surveying data: land cadastre, building cadastre, cadastre of public infrastructure, register of spatial units, real estate register; data on land use and graphical units of rural land use, data of legal regimes, Environmental Atlas, web atlases and globes (Google Earth), data quality and</li> <li>• role of a land surveyor and surveying in the society: boundary handling, spatial planning interventions, project stake-out in the field, real estate valuation, land management, displacement monitoring, definition of the Earth's shape and size, location services, mapping, establishment of 3D terrain or object models, etc.</li> </ul> <p><b>Tutorials:</b></p> <p>To show in a selected area the principles and techniques of data acquisition (examination of the functioning of basic measuring instruments, interpretation of satellite image, use of basic data records) up to the allocation of a spatial intervention (examination of land surveyor's field work) in order to make students understand individual theoretic concepts and the related processes in space.</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### Temeljna literatura in viri/Readings:

Ferlan, M. 2005. Geodetske evidence – evidentiranje nepremičnin. Ljubljana, UL - FGG.

Juvančič, J. 2000. Geodezija za gozdarje in krajinske arhitekto, Ljubljana, UL- BF.

Kogoj, D., Stopar, B. Geodetska izmera. Gradivo za strokovni izpit iz geodetske stroke, Ljubljana, Inženirska zbornica Slovenije, Matična sekcija geodetov.

Dostopno na: [http://www.e-prostor.gov.si/fileadmin/ogs/GEODETSKA\\_IZMERA.pdf](http://www.e-prostor.gov.si/fileadmin/ogs/GEODETSKA_IZMERA.pdf)

Korošec, b. 1978. Naš prostor v času in projekciji, oris razvoja zemljemerstva, kartografije in prostorskega urejanja na osrednjem Slovenskem. Ljubljana, GZS.

Simoneti, M., Zavodnik Lamovšek, A. 2009. Prostor za vsakdanjo rabo: širimo znanje za sodelovanje pri urejanju prostora. Ljubljana: Ministrstvo za okolje in prostor.

Šumrada, R. 2005. Strukture in analize prostorskih podatkov. Ljubljana, UL- FGG.

### Cilji in kompetence:

### Objectives and competences:

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Cilja:</b> <ul style="list-style-type: none"> <li>• razumevaje kompleksnosti obravnavanja prostora, prostorskih podatkov in geodetskih del,</li> <li>• razumevanje grafičnega in tekstualnega dela prostorskih načrtov na različnih ravneh načrtovanja, predvsem pa na občinski ravni.</li> </ul> <b>Kompetence:</b> <ul style="list-style-type: none"> <li>• spoznavanje temeljnih vsebin in pojmov povezanih z vlogo geodezije in prostorskega planiranja ter uporabo prostorskih podatkov,</li> <li>• spoznavanje dela drugih strok v povezavi z upravljanjem prostora,</li> <li>• spoznavanje interdisciplinarnega in integralnega pristopa k reševanju strokovnih vprašanj,</li> <li>• spoznavanje in razumevanje konkretnih primerov iz geodetske in prostorske prakse ter njuno medsebojno povezanost,</li> <li>• usposobiti študente za samostojno razumevanje prostorskih podatkov, kart in načrtov,</li> <li>• pokazati pomen in vlogo geodetske in prostorske stroke pri reševanju pravnih vprašanj ter</li> <li>• navajati študente na samostojno delo.</li> </ul> | <b>Objectives:</b> <ul style="list-style-type: none"> <li>• understanding the complex nature of dealing with space, spatial data and surveying works,</li> <li>• understanding graphical and textual parts of spatial plans on different levels of planning, especially on the municipal level.</li> </ul> <b>Competences:</b> <ul style="list-style-type: none"> <li>• learning about basic contents and concepts related to the role of surveying and spatial planning and the use of spatial data,</li> <li>• learning about the work of other professions related to land management,</li> <li>• learning about interdisciplinary and integral approach to solving expert issues,</li> <li>• learning about and understanding real cases from surveying and spatial practice and their mutual connections,</li> <li>• qualifying students for independent understanding of spatial data, maps and plans,</li> <li>• showing the importance and the role of surveying and spatial profession in solving legal questions and</li> <li>• accustoming students for independent work.</li> </ul> |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**Predvideni študijski rezultati:**

- Seznanitev s strokovno terminologijo, osnove razumevanja geodetske in prostorske stroke ter povezanosti z drugimi strokami.
- Razumevanje prostorskih podatkov, različnih kartografskih podlag in načrtov na lokalni ravni.
- Razumevanje konkretnih primerov iz prakse ter usposobljenost za sodelovanje z geodetsko in prostorsko stroko.

**Intended learning outcomes:**

- Learning about expert terminology, basic understanding of geodetic and spatial profession and its relations to other professions.
- Understanding spatial data, different cartographic bases and plans on the local level.
- Understanding real cases from practice and qualification for cooperation with surveying and spatial profession.

**Metode poučevanja in učenja:**

Predavanja, seminarske in terenske vaje (praktične meritve).

**Learning and teaching methods:**

Lectures, seminar tutorial and field work (practical measurements).

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

|                              |         |                                 |
|------------------------------|---------|---------------------------------|
| Pisni izpit (teoretičen del) | 40,00 % | Written exam (theoretical part) |
| Naloge in sprotno delo       | 30,00 % | Homework and continuous work    |
| Projekt (seminarska naloga)  | 30,00 % | Project (seminar work)          |

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

PAVLOVČIČ PREŠEREN, Polona, STOPAR, Bojan. Izračun položaja GPS-satelita iz podatkov preciznih efemerid = GPS-orbit computation from precise ephemeris data. Geod. vestn. [Tiskana izd.], 2005, letn. 49, št. 2, str. 177-190.

PAVLOVČIČ PREŠEREN, Polona, STOPAR, Bojan. Wavelet Neural Network employmnet for continuous GNSS orbit function construction: Application for the Assisted - GNSS principle. Applied soft computing, 2013, letn. 13, št. 5, str. 2526-2536.

STERLE, Oskar, STOPAR, Bojan, PAVLOVČIČ PREŠEREN, Polona. Modeliranje ionosferske refrakcije za izboljšavo absolutnega GNSS-položaja s kodnimi instrumenti : priprava na 24. Sončev cikel = Ionosperic refraction modeling for better autonomous GNSS code positioning: in preparation of solar cycle 24. Geodetski vestnik, ISSN 0351-0271. [Tiskana izd.], 2013, letn. 57, št. 1, str. 9-24

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|               |                                              |
|---------------|----------------------------------------------|
| Predmet:      |                                              |
|               | <b>OSNOVNE RAČUNSKE METODE ZA INŽENIRJE</b>  |
| Course title: |                                              |
|               | <b>BASIC COMPUTING METHODS FOR ENGINEERS</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik | Semestri |
|----------------------------------------------------------|---------------------------------|--------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) |        | Letni    |

|                                                     |      |
|-----------------------------------------------------|------|
| Univerzitetna koda predmeta/University course code: | 1736 |
|-----------------------------------------------------|------|

| Predavanja | Seminar | Vaje | Klinične vaje | Druge oblike študija | Samostojno delo | ECTS |
|------------|---------|------|---------------|----------------------|-----------------|------|
| 15         | 0       | 0    | 45            | 0                    | 60              | 4    |

|                            |               |
|----------------------------|---------------|
| Nosilec predmeta/Lecturer: | Gašper Jaklič |
|----------------------------|---------------|

|                             |                  |
|-----------------------------|------------------|
| Vrsta predmeta/Course type: | izbirni/Optional |
|-----------------------------|------------------|

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

| Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti: | Prerequisites:            |
|-----------------------------------------------------------------------|---------------------------|
| Vpis v 2. letnik.                                                     | Enrolment in the 2. year. |

| Vsebina:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Content (Syllabus outline):                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>Osnove simbolnega računanja v Mathematici,</li> <li>uporaba orodij za simbolično odvajanje, integriranje, reševanje diferencialnih enačb,</li> <li>teorija napak,</li> <li>osnove numeričnega računanja v Matlabu,</li> <li>uporaba numeričnih metod za reševanje sistemov linearnih enačb, nelinearnih enačb in sistemov, numerična interpolacija, numerično integriranje, numerično reševanje navadnih diferencialnih enačb,</li> <li>delo s podatki, izvoz rezultatov in vizualizacija in</li> <li>ilustracija metod na uporabnih problemih.</li> </ul> | <ul style="list-style-type: none"> <li>Basic symbolical computing in Mathematica,</li> <li>use of tools for symbolical differentiation, integration, solving of ordinary differential equations,</li> <li>error theory,</li> <li>basics of numerical computing in Matlab,</li> <li>usage of numerical methods for solving systems of linear equations, nonlinear equations and systems, numerical interpolation, numerical integration, numerical solution of ordinary differential equations,</li> <li>data manipulation, export of results and visualisation and</li> <li>illustration of methods on practical applications.</li> </ul> |

**Temeljna literatura in viri/Readings:**

Knjižni viri (izbrana poglavja):

J. Kozak, *Numerična analiza*, DMFA - založništvo, Ljubljana, 2008

B.N. Datta, *Numerical Linear Algebra and Applications*, Brooks/Cole, Pacific Grove, 1995

E. Zakrajšek, *Matematično modeliranje*, DMFA - založništvo, Ljubljana, 2004

B. Plestenjak, *Razširjen uvod v numerične metode*, DMFA - založništvo, Ljubljana, 2015

gradiva v spletni učilnici

online priročniki za Matlab (Matlab primer, 3rd edition,...) in Mathematico

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

- podati osnovna znanja simboličnega in numeričnega računanja, na katerih lahko grade strokovni predmeti,
- agotoviti obvladovanje osnovnih računskih veščin z računalnikom in
- omogočiti razumevanje matematičnih orodij v praksi in priprava za uporabo pri strokovnih predmetih.

**Kompetence:**

- sposobnost formulacije konkretnih problemov in njihovo numerično reševanje,
- sposobnost numeričnega izračuna in kritične presoje dobljenega rezultata in
- znanje na izvedbenem nivoju,

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

- to give basic knowledge of symbolic and numerical computing which is applied by other courses,
- to ensure basic competences of computer use and
- to enable understanding of mathematical tools in practice and preparation for use in other courses.

**Competences:**

- the ability of formulation of given problems and their numerical solving,
- the ability of numerical computation and critical judgement of the obtained result and
- knowledge at the executonal level

**Predvideni študijski rezultati:**

- Poznavanje osnovnih programov za simbolično in numerično računanje (Mathematica/Maple, Matlab/Octave).
- Uporaba matematičnega znanja za modeliranje inženirskega problema (matematični model, numerično reševanje enačbe, uporaba numerične metode, analiza rezultata).
- Poznavanje metod za simbolično računanje (odvajanje, integracija, reševanje sistemov linearnih enačb, reševanje diferencialnih enačb, ...).
- Poznavanje osnovnih orodij za numerično reševanje sistemov linearnih enačb, nelinearnih enačb in sistemov, numerične interpolacije, numeričnega integriranja in numeričnega reševanja diferencialnih enačb.
- Spretnost sistematičnega, jasnega in preciznega formuliranja problemov in njihovo numerično reševanje.
- Sposobnost uporabe modernih numeričnih računalniških programov.

**Intended learning outcomes:**

- The knowledge of basic programs for symbolical and numerical computations (Mathematica/Maple, Matlab/Octave).
- The use of mathematical knowledge for modeling of an engineering problem (mathematical model, numerical solving of equation, application of a numerical method, analysis of the result).
- The knowledge of methods for symbolical computations (differentiation, integration, solving of systems of linear equations, solving differential equations...).
- The knowledge of basic tools for numerical solving of systems of linear equations, nonlinear equations and systems, numerical interpolation, numerical integration and numerical solving of ODEs.
- The ability of systematical, clear and precise formulation of problem and its numerical solving.

|                                                                                   |                                                                                                                                                   |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Spretnost uporabe literature.</li> </ul> | <ul style="list-style-type: none"> <li>• The ability to use modern numerical computer tools.</li> <li>• The ability to use literature.</li> </ul> |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|

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

|                                                                                                                  |                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| Predavanja (1 ura na teden), vaje v računalniški učilnici (3 ure na teden), domače vaje, konzultacije, internet. | Lectures (1 hour per week), exercises in computer lab (3 hours per week), homework assignments, consultations, internet. |
|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|

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

|                                                 |         |                                                |
|-------------------------------------------------|---------|------------------------------------------------|
| Domače naloge, sprotno delo in projektna naloga | 80,00 % | Homework and regular assignments, project work |
| zagovor projektne naloge                        | 20,00 % | project defence                                |

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

JAKLIČ, Gašper. Uniform approximation of a circle by a parametric polynomial curve. Computer Aided Geometric Design, ISSN 0167-8396, 2016, vol. 41, str. 36-46.

JAKLIČ, Gašper, KANDUČ, Tadej. Hermite and Lagrange interpolation in  $R[sup]d$  by  $G[sup]1$  cubic splines with small strain energy. Journal of numerical mathematics, ISSN 1570-2820, 2015, vol. 23, iss. 3, str. 257-270.

JAKLIČ, Gašper, KOZAK, Jernej, KRAJNC, Marjetka, VITRIH, Vito, ŽAGAR, Emil. High order parametric polynomial approximation of conic sections. Constructive approximation, ISSN 0176-4276, 2013, vol. 38, iss. 1, str. 1-18.

JAKLIČ, Gašper, MODIC, Jolanda. On Euclidean distance matrices of graphs. The electronic journal of linear algebra, ISSN 1081-3810, 2013, vol. 26, str. 574-589.

JAKLIČ, Gašper, KOZAK, Jernej, KRAJNC, Marjetka, ŽAGAR, Emil. On geometric interpolation by planar parametric polynomial curves. Mathematics of computation, ISSN 0025-5718, 2007, vol. 76, no. 260, str. 1981-1993.

JAKLIČ, Gašper, PISANSKI, Tomaž, RANDIĆ, Milan. Characterization of complex biological systems by matrix invariants. Journal of computational biology, ISSN 1066-5277. [Print ed.], 2006, vol. 13, št. 9, str. 1558-1564.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                                |
|----------------------|------------------------------------------------|
| <b>Predmet:</b>      |                                                |
|                      | <b>IZBRANE VSEBINE IZ GEODETSKE IZMERE</b>     |
| <b>Course title:</b> |                                                |
|                      | <b>SELECTED TOPICS FROM GEODETIC SURVEYING</b> |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik | Semestri     |
|----------------------------------------------------------|---------------------------------|--------|--------------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) |        | Zimski/Letni |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1735 |
|------------------------------------------------------------|------|

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

|                                   |                                          |
|-----------------------------------|------------------------------------------|
| <b>Nosilec predmeta/Lecturer:</b> | Aleš Marjetič, Polona Pavlovčič Prešeren |
|-----------------------------------|------------------------------------------|

|                                    |                  |
|------------------------------------|------------------|
| <b>Vrsta predmeta/Course type:</b> | Izbirni/Optional |
|------------------------------------|------------------|

|                          |                      |             |
|--------------------------|----------------------|-------------|
| <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.                                                            | Enrolment in the 3rd year. |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <ul style="list-style-type: none"> <li>Opredelitev specifičnih pogojev s poudarkom na omejitvah izbire določene merske tehnike ali metode izmere za posamezno geodetsko nalogo,</li> <li>izbira ustreznega merskega instrumentarija za izmero s poudarkom na njegovih omejitvah,</li> <li>predhodna ocena dosegljive kakovosti meritev v specifičnih pogojih izmere,</li> <li>ocena kakovosti meritev v za posamezno geodetsko nalogo,</li> <li>vzpostavitev koordinatnega sistema za izhodišče meritev ali izvedbo kontrole meritev,</li> </ul> | <ul style="list-style-type: none"> <li>Specific condition determination with the focus on measurement technology as well as method restrictions for the specific geodetic task,</li> <li>selection of the appropriate measuring instrumentation with the emphasis on its limitations,</li> <li>prior quality assessment of measurement achievement in specific conditions,</li> <li>quality assessment of measurements acquired at the field,</li> <li>coordinate system establishment further used for the reference or control base of measurements,</li> </ul> |

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| <ul style="list-style-type: none"> <li>• vzpostavitev ustreznih pogojev za prehod med koordinatnimi sistemi,</li> <li>• vplivi na opazovanja v specifičnih pogojih,</li> <li>• izmera v specifičnih pogojih z zahtevo določitve položajev v lokalnem in/ali globalnem koordinatnem sistemu,</li> <li>• geodetske naloge v specifičnih pogojih: a) nagnjen teren, b) zaraščen teren, c) urbano območje, d) različne kombinacije zgoraj naštetih</li> <li>• obdelava meritev, določitev položajev točk in prikaz stanja na izbrani geodetski podlagi in</li> <li>• delo s podatki in priprava ustreznih podatkov za izvoz v podatkovne baze za potrebe nadaljnje rabe.</li> </ul> | <ul style="list-style-type: none"> <li>• establishment of appropriate conditions for the transition between different coordinate systems,</li> <li>• defining impacts/influences on observation in specific measurement conditions,</li> <li>• measurement performance in specific conditions by requiring positioning in local and/or global coordinate system,</li> <li>• surveying problems under different conditions: a) steep terrain work, b) area, overgrown by vegetation c) urban area, d) various combinations of the above- mentioned conditions,</li> <li>• processing of data acquired at the field with final goal of point position determination and visualizing on the selected geodetic topographic basis and</li> <li>• data manipulation and exporting into different databases for further usage.</li> </ul> |
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**Temeljna literatura in viri/Readings:**

Anderson, J. M., Mikhail, J. E.: Surveying, theory and practice, 7. izdaja, McGraw-Hill, 1998.

Torge W.: Geodesy, 2. izdaja Walter de Gruyter, 1991.

G. Strang, K. Borre: Linear algebra, geodesy and GPS, Wellesley Cambridge Press, 1997.

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

- podati osnovne smernice odločitve o izbiri postopka izmere v specifičnih pogojih,
- spoznati prednosti in pomanjkljivosti, različnih metod v različnih pogojih,
- uporaba kombiniranih rešitev določanja položaja v različnih pogojih,
- ocena kakovosti meritev in rezultatov,
- praktična izvedba izmere v različnih pogojih,
- obdelava opazovanj v različnih pogojih do določitve položaja v izbranem koordinatnem sistemu in
- povezava rezultatov z drugimi geodetskimi podatki z možnostjo ocene kakovosti le-teh.

**Kompetence**

- sposobnost formulacije rešitve konkretnih geodetskih problemov,
- sposobnost samostojne uporabe geodetskih merskih tehnik in instrumentov v različnih pogojih izmere,
- znanje na izvedbenem nivoju izmere in obdelave opazovanj,
- znanje interpretacije kakovosti končnih rezultatov.

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

- to provide basic concepts of making decisions in measurement performance in specific conditions,
- to ensure knowledge about advantages and disadvantages of different methods under specific conditions
- application about combined solutions in object determination under various conditions,
- quality assessment of measurements and results,
- practical implementation of different measurement method under specific conditions,
- observation processing in a variety of conditions for positioning in the selected coordinate system and
- combining results with other geodetic source of data.

**Competences:**

- the ability of the geodetic problem solution formulation,
- the ability of independent use of different geodetic methods and instruments in different conditions,

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|  | <ul style="list-style-type: none"> <li>• knowledge on the operative level in field measurement performance as well as in data processing,</li> <li>• knowledge of quality interpretation of results.</li> </ul> |
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**Predvideni študijski rezultati:****Intended learning outcomes:**

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| <ul style="list-style-type: none"> <li>• Poznavanje prednosti in pomanjkljivosti metod geodetske izmere s sposobnostjo izbire ustrezne metode izmere.</li> <li>• Uporaba različnih merskih postopkov in obdelave opazovanj za rešitev problema.</li> <li>• Uporaba različnih programskih paketov obdelave raznovrstnih opazovanj in povezovanje le-teh</li> <li>• Izdelava lastnih programskih rešitev določanja položaja v različnih specifičnih pogojih.</li> <li>• Sposobnost jasnega formuliranja problemov in postavitve koncepta njihovega reševanja po korakih.</li> <li>• Spretnost iskanja in uporabe obstoječe literature, programskih paketov obdelave ter spletnih aplikacij.</li> </ul> | <ul style="list-style-type: none"> <li>• Knowledge of advantages and disadvantages of specific measurement methods in field data acquisition with the ability of proper method selection.</li> <li>• The ability of using different measurement procedures and observation processing with the aim of the specific problem solution.</li> <li>• The ability of using different software packages for processing diverse types of measurements with the goal of combining them.</li> <li>• Creating individual program solutions for data processing in the various specific conditions.</li> <li>• Clear problem formulation and setting the concept of its numerical solution.</li> <li>• Skills in using existing literature, software and web applications.</li> </ul> |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

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| Predavanja (2 uri tedensko), praktične terenske vaje in obdelava v računalniški učilnici (4 ure tedensko), domače vaje, konzultacije, izdelava seminarja | Lectures (2 hours per week), practical field work and exercises in computer lab (4 hours per week), homework assignments, consultations, internet |
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**Načini ocenjevanja:****Delež/Weight****Assessment:**

|                                  |         |                                             |
|----------------------------------|---------|---------------------------------------------|
| izpit                            | 50,00 % | exam                                        |
| Domače naloge, sprotno delo      | 20,00 % | Homework and regular assignments            |
| Ocena seminarja s predstavitvijo | 30,00 % | Evaluation of the seminar with presentation |

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

KLOPČIČ, Jure, AMBROŽIČ, Tomaž, MARJETIČ, Aleš, GAMSE, Sonja, PULKO, Boštjan, LOGAR, Janko. Use of automatic target recognition system for the displacement measurements in a small diameter tunnel ahead of the face of the motorway tunnel during excavation. *Sensors*, ISSN 1424-8220, 2008, vol. 8, no. 12, str. 8139-8155

KREGAR, Klemen, AMBROŽIČ, Tomaž, KOGOJ, Dušan, VEZOČNIK, Rok, MARJETIČ, Aleš. Determining the inclination of tall chimneys using the TPS and TLS approach. *Measurement*, ISSN 0263-2241. [Print ed.], Nov. 2015, vol. 75, str. 354-363

MARJETIČ, Aleš, KREGAR, Klemen, AMBROŽIČ, Tomaž, KOGOJ, Dušan. An Alternative Approach to Control Measurements of Crane Rails. *Sensors*, ISSN 1424-8220, 2012, letn. 12, št. 5, str. 5906-5918

SAVŠEK, Simona, AMBROŽIČ, Tomaž, STOPAR, Bojan, TURK, Goran. Determination of Point Displacements in the Geodetic Network. *Journal of surveying engineering*, ISSN 0733-9453, 2006, letn. 132, št. 2, str. 58-63

- SAVŠEK, Simona, AMBROŽIČ, Tomaž, STOPAR, Bojan, KOGOJ, Dušan. Local stability monitoring of the Koper tide gauge station. *AVN. Allgemeine Vermessungs-Nachrichten*, ISSN 0002-5968, 2008, letn. 115, št. 6, str. 210-215
- SAVŠEK, Simona, GREGORN, Zoran, AMBROŽIČ, Tomaž. Measuring meteorological data along the ray path of a distance meter with an ultra-light aircraft. *Survey review*, ISSN 0039-6265, 2013, letn. 45, št. 328, str. 3-12
- STERLE, Oskar, STOPAR, Bojan, PAVLOVČIČ PREŠEREN, Polona. Single-frequency precise point positioning: an analytical approach. *Journal of geodesy*, ISSN 0949-7714, 2015, letn. 89, št. 8, str.793-810
- MARJETIČ, Aleš, PAVLOVČIČ PREŠEREN, Polona. Določitev položajev cerkvenih zvonikov v koordinatnem sistemu D96/TM = Position determination of church belfries in the D96/TM coordinate system. *Geodetski vestnik: glasilo Zveze geodetov Slovenije*. 2018, letn. 62, št. 4, str. 587-603
- BAŽEC, Matej, DIMC, Franc, PAVLOVČIČ PREŠEREN, Polona. Evaluating the vulnerability of several geodetic GNSS receivers under chirp signal L1/E1 jamming. *Sensors*, 2020, vol. 20, iss. 3, str. 1-25, ilustr. ISSN 1424-8220.

## UČNI NAČRT PREDMETA/COURSE SYLLABUS

|                      |                                       |
|----------------------|---------------------------------------|
| <b>Predmet:</b>      |                                       |
|                      | <b>BLIŽNJESLIKOVNA FOTOGRAMETRIJA</b> |
| <b>Course title:</b> |                                       |
|                      | <b>CLOSE RANGE PHOTOGRAMMETRY</b>     |

| Študijski programi in stopnja                            | Študijska smer                  | Letnik | Semestri |
|----------------------------------------------------------|---------------------------------|--------|----------|
| Geodezija in geoinformatika, prva stopnja, univerzitetni | Ni členitve (študijski program) |        | Letni    |

|                                                            |      |
|------------------------------------------------------------|------|
| <b>Univerzitetna koda predmeta/University course code:</b> | 1804 |
|------------------------------------------------------------|------|

| 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> | Mojca Kosmatin Fras |
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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>              |
|------------------------------------------------------------------------------|------------------------------------|
| Poznavanje osnov fotogrametrije.                                             | Basic knowledge of photogrammetry. |

| <b>Vsebina:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Content (Syllabus outline):</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| <p>Uvod v bližnjieslikovne aplikacije.</p> <p>Bližnjieslikovni fotogrametrični projekti od načrtovanja do izvedbe: pripravljalna, terenska, pisarniška in zaključna dela.</p> <p>Uporaba metod kalibracije nemerskih fotoaparotov v bližnjieslikovnih aplikacijah.</p> <p>Postopki enoslikovnega, dvoslikovnega in večslikovnega zajema.</p> <p>Dokumentiranje kulturne dediščine: mednarodni akti in organizacije, pomen in načela ohranjanja kulturne</p> | <p>Introduction to close range applications.</p> <p>Close range photogrammetric projects from planning to execution: preparatory, field, office and final work.</p> <p>Use of non-metric camera calibration methods in close range applications.</p> <p>Mono-, stereo- and multiple-image acquisition.</p> <p>Cultural heritage documenting: international acts and organizations, meaning and principles of maintaining cultural heritage, technical documenting of cultural heritage in Slovenia.</p> |

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| <p>dediščine, tehnično dokumentiranje kulturne dediščine v Sloveniji.</p> <p>Nivoji dokumentacije in vrste izdelkov: fotografija, fotografiranje po pravilih 3 x 3, preventivno snemanje, izdelava fotogrametrične dokumentacije do končnega izdelka.</p> <p>Uporaba daljinsko vodenih letalnikov/sistemov: osnove načrtovanja snemanja in fotogrametrične obdelave.</p> <p>Primeri različnih bližnjelikovnih fotogrametričnih aplikacij (industrija, forenzika ipd.).</p> <p>Izvedba projektne naloge po skupinah.</p> | <p>Levels of documentation and types of products: photography, photographing according to 3x3 rules, preventive surveying, production of photogrammetric documentation to the final products.</p> <p>Use of unmanned aerial vehicles/systems: the basics of mission planning and photogrammetric processing.</p> <p>Examples of different close range photogrammetric applications (industry, forensics etc.).</p> <p>Project work accomplished in groups.</p> |
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**Temeljna literatura in viri/Readings:**

Luhmann, T. et al. 2006. Close range photogrammetry – principles, methods and applications. Whittles Publishing.

Atkinson, K.B. 2001. Close Range Photogrammetry and Machine Vision. Whittles Publishing.

Kraus, K. 2007. Photogrammetrie, Geometry from Images and Laser Scans, 2nd edition. Walter de Gruyter.

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

- študenti pridobijo znanje s področja bližnjelikovnih fotogrametričnih aplikacij,
- študenti pridobljeno znanje preizkusijo praktično na konkretnem primeru.

**Pridobljene kompetence:**

- načrtovanje bližnjelikovnih fotogrametričnih projektov,
- kalibracija digitalnih fotoaparátov,
- terensko snemanje in zajem podatkov in
- izdelava različnih vrst izdelkov.

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

- students gain knowledge of close range photogrammetric applications,
- students apply the gained knowledge in a practical example.

**Competences:**

- preparing a plan for close range photogrammetric project execution,
- calibration of digital cameras,
- field surveying and data acquisition and
- ability to produce different kinds of products.

**Predvideni študijski rezultati:**

- Študenti osvojijo teoretično in praktično znanje, ki je potrebno za izvajanje bližnjelikovnih aplikacij,
- obvladovanje aplikacij dokumentiranja kulturne dediščine (arhitektura, arheologija), druge aplikacije spozna informativno,
- uporaba in kalibracija nemerskih digitalnih fotoaparátov, uporaba različnih metod v praksi, pravilnega strokovnega odločanja in izbire primernih metod glede na zahteve konkretnega projekta, povezovanje in uporaba znanj, ki ga pridobijo pri drugih predmetih in navajanje na

**Intended learning outcomes:**

- Students gain theoretical and practical knowledge that is needed to execute close range applications,
- managing the applications of documenting cultural heritage (architecture, archaeology), other applications are learned in a general way,
- learn to use and calibrate non-metric digital cameras,
- learn to use different methods in practice, by taking proper professional decisions and choices when selecting the appropriate methods for a particular project, combining and usage

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| timsko delo, načrtovanje in vodenje praktičnih projektov ter interdisciplinarni pristop. | knowledge acquired in other courses and accustoming to teamwork, planning and managing practical projects as well as apply the interdisciplinary approach. |
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**Metode poučevanja in učenja:****Learning and teaching methods:**

|                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                 |
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| <b>Predavanja</b><br>Izvedba v predavalnici, uporaba prosojnic, grafične ponazoritve, demonstracije, primeri iz prakse.<br><b>Praktične vaje</b><br>Izvedba v računalniški učilnici pod vodstvom in ob usmerjanju pedagoga. Uporaba specializirane fotogrametrične opreme, terenski zajem podatkov. | <b>Lectures</b><br>Lectures in classroom, use of slides, graphical presentations, demonstrations, practical examples.<br><b>Practical work</b><br>Exercises in computer classrooms under the supervision of the lecturer. Use of specialized photogrammetric equipment, field data acquisition. |
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**Reference nosilca/Lecturer's references:**

PETROVIČ, Dušan, GRIGILLO, Dejan, KOSMATIN FRAS, Mojca, URBANČIČ, Tilen, KOZMUS TRAJKOVSKI, Klemen. Geodetic methods for documenting and modelling cultural heritage objects. *International journal of architectural heritage: conservation, analysis and restoration*, ISSN 1558-3058. [Print ed.], [nov.] 2019

GRIGILLO, Dejan, URŠIČ, Matija, BONE, Matej, AMBROŽIČ, Tomaž, PAVLOVČIČ PREŠEREN, Polona, KOSMATIN FRAS, Mojca. Analysis of the impact of interior orientation parameters in different UAV-based image-block compositions on positional accuracy. *Metrologia i Systemy Pomiarowe*, ISSN 0860-8229, 2018, vol. 25, no. 3, str. 617-629.

POTOČNIK, Irena, KOBE, Jurij, KOSMATIN FRAS, Mojca. Tehnološki vidik beleženja barv pri dokumentiranju in vrednotenju arhitekturne dediščine = Technological aspects of recording colors in documentation and evaluation of the architectural heritage. AR: arhitektura, raziskave, ISSN 1580-5573., 2015, Št. 2, str. 6-23.