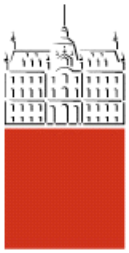
Univerza
v Ljubljani

Fakulteta
za gradbeništvo
in geodezijo



Učni načrti

Magistrski študijski program druge stopnje

STAVBARSTVO (MA)

Course Syllabi

2nd cycle master study

BUILDINGS (MA)

KAZALO / TABLE OF CONTENTS

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Uporabna geometrija
Course title:	Applied geometry

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Stavbarstvo – druga stopnja MA		1	1
Buildings – second cycle MA		1	1

Vrsta predmeta / Course type:	Obvezni strokovni / obligatory professional
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45		30	15		90	6

Nosilec predmeta / Lecturer:	izr.prof.dr. Marjeta Kramar Fijavž, doc.dr. Mitja Lakner

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Opravljen izpit iz predmetov Uvod v matematiko ter Vektorska algebra in analiza oz. iz drugih predmetov s primerljivo vsebino.	Passed exams in Introduction to Mathematics and Vector Algebra and Analysis, or other courses with comparable content

Vsebina:	**Content (Syllabus outline):**
Konveksnost (konveksnost geometrijskih objektov); krivulje v ravnini in prostoru (parametrizacija, aproksimacija krivulj, Bezierove krivulje, B- zlepki); ploskve (gladka elementarna ploskev, odsekoma gladka ploskev, ploskve drugega reda, premonosne ploskve, rotacijske ploskve, aproksimacija ploskev, Bezierove ploskve); poliedri (platonska telesa, transformacije platonskih teles); zapolnitev prostora; fraktali.	Convexity; curves in plane and space (parameterisation, approximation, Bezier curves, B-splines); surfaces (elementary smooth surfaces, piecewise smooth surfaces, surfaces of a second order, ruled surfaces, surfaces of revolution, approximations, Bezier surfaces); polyhedra (Platonic solids, transformations); tessellations; fractals.

Temeljni literatura in viri / Readings:

Farin, G. 2002. Curves and surfaces for CAGD. Morgan – Kaufmann.
Glaeser, G. 2005. Geometrie und ihre Anwendungen. Elsevier.
Kappraff, J. 1991. Connections – the geometric bridge between art and science. World scientific.
Protter, M. H., Morrey, C. B. 1991. A First Course in Real Analysis. Springer - Verlag.
Spletne strani Katedre za matematiko in fiziko. Dostopno na: http://www.kmf.fgg.uni-lj.si/Matematika/.

Cilji in kompetence:

Cilji
- Zagotoviti solidno razumevanje osnov geometrije.
- Demonstrirati uporabnost doseženih matematičnih znanj.
- Seznaniti z vsaj enim računalniškim programom za geometrijsko oblikovanje.
- Vpeljati v samostojno in v timsko, projektno orientirano delo.

Pridobljene kompetence
- Sposobnost rešitve nekaterih netrivialnih geometrijskih problemov s kombiniranjem znanja matematike in računalništva.
- Sposobnost klasifikacije geometrijskega problema.
- Pridobitev ustrezne literature/podpore.

Objectives and competences:

Objectives:
- To enable solid understanding of basics of geometry.
- To demonstrate applicability of achieved mathematical knowledge.
- To get acquainted with at least one computer software for geometric design.
- To introduce project based working, individually as well as in a team.

Gained competences:
- To be able to combine mathematical and computational knowledge in order to solve some nontrivial problems in geometry.
- Capability of classification of a given geometrical problem and acquirement of the appropriate literature.

Predvideni študijski rezultati:
- Poglobljeno razumevanje geometrije v prostoru.
- Zna izbrati primerno orodje, s katerim si pomaga pri računalniškem delu.
- Obvladovanje matematičnega aparata do stopnje, ko se lahko suvereno uporablja zmogljiv računalniški program, kot je npr. Mathematica, s katerim je možno samostojno konstruirati različne geometrijske objekte ter študirati njihove lastnosti in medsebojne odnose.
- Doseženo znanje uporablja inženir pri načrtovanju.
- Geometrijskih objektov ter pri reševanju geometrijskih problemov v inženirski praksi.
- Sposobnost kritične presoje dobljenih računalniških rezultatov.

Intended learning outcomes:
- In-depth understanding of the geometry in three dimensions.
- Capability of picking the appropriate tools for computations.
- Mastering theoretical knowledge to be able to use an efficient computational tool (e.g. Mathematica) to construct various geometrical objects and to study their properties and relations.
- The achieved knowledge is used for the design of geometrical objects and solving geometrical problems in engineering practice.
- Capability of a critical judgement of the obtained numerical results.

Metode poučevanja in učenja:

Predavanja, seminarske naloge, laboratorijske vaje, domače naloge.

Learning and teaching methods:

Lectures, tutorials, consultations, internet.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Izpit (teoretičen del)	**30 %**	Exam (theoretical part)
Računske naloge in sprotno delo	**70 %**	Exercises and homework

Reference nosilca / Lecturer's references:

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/10.1017/1446181112000065.
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.

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.

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Konstrukcijska gradbena fizika
Course title:	Structural building physics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Stavbarstvo – druga stopnja MA		1	1
Buildings – second cycle MA		1	1

Vrsta predmeta / Course type: Obvezni strokovni / obligatory professional

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
60		60	60		180	12

Nosilec predmeta / Lecturer: prof. dr. Jožef Peternelj, izr. prof. dr. Zvonko Jagličić

Jeziki / Languages:	
Predavanja / Lectures:	slovenski / Slovene
Vaje / Tutorial:	slovenski / Slovene

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

Vsebina:	**Content (Syllabus outline):**
Predavanja: Difuzijska enačba, robni pogoji in odzivni dinamični parametri ovojnega sklopa zgradb. Podrobna analiza toplotnih mostov in konvekcija. Prenos toplote s sevanjem med posameznimi segmenti ovojnega sklopa in sevalne karakteristike materialov (absorptivnost, emisivnost in sipanje). Kondenzacija in transport vlage ter njen vpliv na termodinamske karakteristike ovojnega sklopa zgradbe. Vidna svetloba, svetlobni tok ter razširjanje, odboj in absorpcija svetlobe na posameznih elementih ovojnega sklopa. Zvok v zaprtih prostorih, hrup in kontrola hrupa, merilni instrumenti in merilne metode v akustiki in analizi hrupa. Vaje: Računska analiza izbranih primerov iz prakse s pomočjo analitičnih metod. Uporaba računalniških programov za reševanje problemov iz prakse.	Lectures: Diffusion equation, boundary and initial conditions, and dynamical response parameters of building envelope. Detailed analysis of thermal bridges and Convection. Thermal radiation heat transfer between structural components of building envelope and radiation characteristics of the corresponding materials (absorptivity, emissivity, and scattering cross-sections). Condensation, moisture transport and its influence on thermodynamic properties of the building envelope. Light, radiation flux, propagation, reflection and absorption of light on various surfaces of structural components forming the building envelope. Sound in enclosed spaces, noise and noise control, measuring equipment and measurement techniques in acoustics and noise analysis. Exercises: Solving practical engineering problems using analytical methods. Application of computer programs to solve problems encountered in engineering practice.

Temeljni literatura in viri / Readings:

Kladnik, R. 1983. Nestacionarni temperaturni pojavi v ovojnem sklopu zgradbe, FAGG.
Luikov, A.V. 1975. Heat and mass transfer in capillary porous bodies. Oxford, Pergamon.
Biess, D.A., Hansen, C.H. 2003. Engineering Noise Control, Theory and Practice, 3rd edition. Spon Press.
Siegel, R., Howell, J.R. 1972. Thermal Radiation Heat Transfer. McGraw-Hill.
Peternelj, J., Jagličić, Z. 2014. Osnove gradbene fizike. UL, FGG.

Cilji in kompetence:

Cilji:
- Nadgraditi osnovno znanje nestacionarne termodinamike, zvočnih pojavov in svetlobnih pojavov z znanjem, ki je specifično za te pojave v grajenem okolju.
- Podati poglobljeno znanje prenosa toplote z prevajanjem, konvekcijo in sevanjem, ter zvočnih in svetlobnih pojavov v gradbeništvu.
- Podati matematične metode reševanja difuzijske in valovne enačbe z upoštevanjem robnih pogojev karakterističnih za zgradbe in druge gradbene objekte.
- Podati pregled računalniških orodij primernih za numerično reševanje konkretnih problemov.

Pridobljene kompetence:
- Sposobnost fizikalno-matematične formulacije praktičnih problemov na teh področjih.
- Pravilna izbira matematičnega orodja.

Objectives and competences:

Objectives:
- To expand knowledge and acquire new skills in applications of non-stationary thermodynamics, acoustics and photometry specific to buildings and urban environment. In particular this includes:
- In-depth analysis of heat transfer via conduction, convection and radiation.
- Sound and light effects in buildings and civil engineering in general.
- Mathematical methods used for the solution of diffusion and wave equations subject to particular initial and boundary conditions.
- Overview of available computer programs to solve the above problems.

Gained competences:
- Ability to formulate engineering problems using appropriate physical and mathematical methods in order to obtain quantitative results.

Predvideni študijski rezultati:

- Pridobljeno poglobljeno znanje o prenosu toplote, vlage in zvoku ter hrupu v zaprtih prostorih.
- Razumevanje matematičnih metod za opis in analizo fizikalnih procesov povezanih s toplotnimi in zvočnimi pojavi v zgradbah.
- Osvojene računske spretnosti za analitično in numerično reševanje konkretnih problemov.
- Doseženo znanje uporabljajo pri izdelavi diplomskega dela oz. v inženirski praksi.
- Dobro razumevanje toplotnih in akustičnih pojavov v zgradbah je osnova za varčno rabo energije in primerno izbiro materialov za konstrukcijske sklope.
- Sposobnost fizikalno-matematične formulacije procesov v ovojnem sklopu zgradbe.
- Sposobnost izbire primernega matematičnega orodja za analizo praktičnih problemov.

Intended learning outcomes:

- In-depth knowledge of heat and moisture transport across structural components in buildings, sound effects and noise in enclosures.
- Understanding of physical processes involved in these phenomena and ability to use appropriate mathematical methods used for their analysis.
- Application of the above skills in actual solving of practical problems or for writing research proposals.
- Good understanding of heat and acoustic phenomena leads to economic use of energy in buildings and, in addition, to proper choice of materials for structural components.
- Ability of exact physical and mathematical formulation of processes taking place in the building envelope. Selection of appropriate mathematical methods and tools for the analysis of practical problems.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, računski zgledi na vajah in uporaba prosto dostopnih računalniških programov za izračun prenosa toplote in vlage skozi konstrukcijske sklope.	Lectures and problem solving classes Application of a freely available computer programs designed for solving heat and moisture transport problems.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Pisni izpit	**30 %**	Written exam
Ustni zagovor domačih nalog	**70 %**	Oral defence of home assignments

Reference nosilca / Lecturer's references:

KRANJC, Tomaž, PETERNELJ, Jože. Heat flow in composite rods : an old problem reconsidered. Int.j. heat mass transfer. [Print ed.], apr. 2011, letn. 54, št. 9-10, str. 2203-2206
KRANJC, Tomaž, PETERNELJ, Jože, KOZAK, Jernej. The rate of heat flow through a flat vertical wall due to conjugate heat transfer. Int. j. heat mass transfer. [Print ed.], februar 2010, letn. 53, št. 5/6, str. 1231-1236
KRANJC, Tomaž, PETERNELJ, Jože. The Rate of Heat Flow through Non-Isothermal Vertical Flat Plate. V: BELMILOUDI, Aziz (ur.). Heat trasfer - theoretical analysis, experimental investigations and industrial systems. First published January, 2011. Rijeka: InTech Open Access, 2011, str. 617- 634

COTIČ, Patricia, JAGLIČIĆ, Zvonko, NIEDERLEITHINGER, Ernst, EFFNER, Ute, KRUSCHWITZ, Sabine, TRELA, Christiane, BOSILJKOV, Vlatko. Effect of moisture on the reliability of void detection in brickwork masonry using radar, ultrasonic and complex resistivity tomography. Mat. struct., 2013, letn. 46, št. 10, str. 1723-1735
COTIČ, Patricia, JAGLIČIĆ, Zvonko, BOSILJKOV, Vlatko. Validation of non-destructive characterization of the structure and seismic damage propagation of plaster and texture in multi- leaf stone masonry walls of cultural-artistic value. Journal of cultural heritage, 2013, 12 str.
JAGLIČIĆ, Zvonko, PAJIĆ, Damir, TRONTELJ, Zvonko, DOLINŠEK, Janez, JAGODIČ, Marko. Magnetic memory effect in multiferroic. Appl. phys. lett., 2013, vol. 102, no. 24, str. 242410-1-242410-4

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Dnevna svetloba
Course title:	Daylight

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Stavbarstvo – druga stopnja MA		1	1
Buildings – second cycle MA		1	1

Vrsta predmeta / Course type:	Obvezni strokovni / obligatory professional
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30		30	30		90	6

Nosilec predmeta / Lecturer:	doc. dr. Mitja Košir

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

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

Vsebina:	**Content (Syllabus outline):**
Predavanja: Prostorske konstituante za bioklimatsko oblikovanje stavb (geografske in podnebne razmere lokacije). Človek (upoštevanje psiho-fizioloških potreb človeka pri oblikovanju bivalnega in delovnega okolja). Stavba (notranji prostor in ovoj). Konfiguracija vplivnih faktorjev (dnevna svetloba, osončenje). Metode za izračun in preverjanje osončenja in dnevnega osvetljevanja. Komponente: stekla, zasteklitve, sečila, nadzorni sistemi. Elementi odprtin: horizontalni in vertikalni sistemi. Strategije oblikovanja bivalnega in delovnega okolja s pomočjo dnevne in sončne svetlobe. Vaje: Seminarske vaje (uporaba znanja na konkretnem primeru v stavbi, oblikovanje koncepta, faktorska analiza, optimizacija sistema (sinteza)). Laboratorijske vaje (simulacije odziva stavbe in prostora s pomočjo programske opreme).	Lectures: Bioclimatic building design within defined space constituents (location, geography, climatic conditions), human (psycho-physiological human needs and the design of living and working environment), building (indoor environment, building envelope systems). Configuration of influential factors (daylight, insolation). Methods for the calculation and verification of insolation and daylight illuminance. Components: glass, glazing, shading devices, control systems. Elements of transparent constructional complexes: horizontal and vertical systems. Strategies for the design of living and working environment on the basis of insolation and daylight illuminance. Tutorial: Tutorial (application of theoretical knowledge in a particular building case, concept design, factor analysis, system optimization (synthesis)). Laboratory work (simulation of the whole building and individual space with appropriate computer software).

Temeljni literatura in viri / Readings:

McMullan, R. 2007. Environmental science in building. New York, Palgrave Macmillan.
Littlefair, P.J. 1995. Site layout planning for daylight and sunlight, A guide to god practice. Construction Research Communications ltd.
Crisinel, M. ed. 2007. Glass & interactive building envelopes, COST C13. IOS Press.
e-učilnica Katedre za stavbe in konstrukcijske elemente na spletu: http://kske.fgg.uni-lj.si .

Cilji in kompetence:

Cilji:
- Izboljšanje kakovosti grajenega okolja.
- Zmanjševanje negativnih vplivov na zunanje okolje.
- Učinkovita izraba virov.
- Pridobivanje znanja, tehničnih spretnosti in oblikovanje inovacijske sposobnosti za dvig kakovosti projektov.

Pridobljene kompetence:
- Obvlada prenos sistema zunanje okolje-ovoj-notranje okolje-človek v konceptualizacijo realne stavbe (navezovanje na ostale gradbeno-fizikalne vplive).
- Razume značilnosti in delovanje sistemov transparentnih delov stavbnega ovoja in njihovih realizacij.
- Pozna izhodišča kontrolnih sistemov in njihovo vlogo pri optimizaciji delovanja odprtin.
- Sposoben je zasnovati in optimizirati sistem svetlobnih odprtin na stavbnem ovoju.
- Sposoben je uporabljati računske metode in programsko opremo za področje dnevnega osvetljevanja in osončenja.
- Sposoben je kritično oceniti in interpretirati pridobljene podatke (rezultate).
- Obvlada veljavno zakonodajo za področje dnevnega osvetljevanja in osončenja stavb.

Objectives and competences:

Objectives:
- The main objectives of the course are to improve the quality of the built environment.
- To minimize negative impacts on the environment.
- Efficient use of natural resources.
- To acquire knowledge and technical skills for improving the quality of building projects.

Gained competences:
- Mastering the transfer of the analysed system: outdoor environment-building envelope-indoor environment-human (in the framework of real building case; linking daylight design to other fields of building physics).
- Understanding the main characteristics and functioning of transparent constructional complexes and their implementation.
- Getting familiar with the basics of control systems and their role in the optimization of transparent constructional complexes functioning.
- Ability to design and optimize a proposed system of transparent constructional complexes.
- Ability to use calculation methods and computer software for daylight illuminance and building insolation analyses.
- Critical evaluation and interpretation of results.
- Getting familiar with current legislation from the field of daylight illuminance and insolation of buildings.

Predvideni študijski rezultati:

- Razumevanje delovanja transparentnih delov stavbnega ovoja, zasnova in analiza vplivov direktnega osončenja in zajema dnevne svetlobe v stavbi, sposobnost ocene odziva stavbe na osončenje in dnevno svetlobo.
- Uporaba računskih metod in programske opreme za analizo obravnavanih elementov svetlobnega in (posredno) toplotnega odziva stavbe oziroma

Intended learning outcomes:

- Understanding the functioning of transparent constructional complexes, design and analysis of the effects of insolation and daylight in the buildings, ability to assess the building response to the insolation and daylight.
- Application of calculation methods and computer software simulations to analyse the evaluated elements with regard to daylighting and indirectly

prostora. – Sposobnost samostojne ocene položaja in vloge obravnavnih elementov v sistemu okolje/človek/stavba. – Identifikacija medsebojnih povezav. – Spretnosti uporabe domače in tuje literature in drugih virov, zbiranja in interpretiranja podatkov, identifikacija. – Reševanje problemov, kritična analiza, sinteza, delo v skupini.	also to thermal response of a building and its active spaces. – Ability to evaluate the status and the role of the analysed elements in the system: environment/human/building, identification of interconnections. – Skills for review of relevant literature sources and other references (national, international), data collecting and interpreting, problem identification, problem solving, critical analysis, synthesis, group work.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, seminarske in laboratorijske vaje.	Lectures, tutorial, laboratory work.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Pisni izpit	**30 %**	Written exam
Ocena izdelka vaj	**70 %**	Tutorial and laboratory work

Reference nosilca / Lecturer's references:

KOŠIR, Mitja, KRAINER, Aleš, DOVJAK, Mateja, KRISTL, Živa. Automatically controlled daylighting for visual and nonvisual effects. Lighting research & technology, ISSN 1477-1535. [Print ed.], 2011, letn. 43, št. 4, str. 439-455.

KOŠIR, Mitja, KRAINER, Aleš, KRISTL, Živa. A study of visual and non-visual effects of daylighting in an office. V: MAHDAVI, A. (ur.). Contributions to building physics. Vienna: Department of building physics and building ecology, 2013, str. 521-527, ilustr.

KOŠIR, Mitja, KRAINER, Aleš, KRISTL, Živa. Predicting of daylight on vertical plane in real office environment for visual and biological effects. V: ISES Solar World Congress 2011 : Rapid Transition to a Renewable Energy World : Proceedings, Avgust 28 - September 2, 2011, Kassel, Germanij. Kassel: International Solar Energy Society, 2011, str. 1- 10.

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Informacijsko modeliranje stavb
Course title:	Building information modelling

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Stavbarstvo – druga stopnja MA		1	2
Buildings – second cycle MA		1	2

Vrsta predmeta / Course type:	Obvezni strokovni / obligatory professional
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30			30		60	4

Nosilec predmeta / Lecturer:	doc. dr. Tomo Cerovšek	
Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

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

Vsebina:	**Content (Syllabus outline):**
Predavanja: Uvod v informacijsko modeliranje stavb (BIM). Metode planiranja uporabe in uvajanja BIM 03. Metode sodelovalnega dela in upravljanja BIM. Metode modeliranja konstruktivnih in nekonstruktivnih elementov stavb za različne potrebe po fazah projekta. Metode modelne analize za trajnostno projektiranje. Metode modeliranja sistemov stavb. Zagotavljanje kakovosti ter odpravljanje ovir pri uporabi BIM ter pregled aspektnih modelov ter ogrodij BIM. OpenBIM in protokoli za izmenjavo BIM 09. Standardizacija BIM pri projektih PAS, IFC, CIS2. Napredne tehnike parametrizacije BIM. Vaje: BIM (Building information model) Informacijsko modeliranje stavb: konstrukcijski elementi, sestavi, izvlečki za potrebe različnih analiz. Izdelava študij izvedljivosti in analiza variant izvedbe na osnovi informacijskih modelov stavb. Izdelava parametričnih modelov in analiza Green Bim,	Lectures: Introduction to building information model. BIM execution planning and implementation. BIM collaboration and management. Methods of modelling load-bearing and non-load bearing elements. BIM for Sustainable Design. Methods of modelling Building Systems. QA procedures in BIM and overview of BIM aspect and framework models. OpenBIM protocols for exchange of BIM. Standardization: BS 1192, IFC, CIS, IFD10. Advanced BIM parameterization techniques. Tutorial: Development of BIM, structural and non- structural elements, composites, schedules. Development of design alternatives and 3D coordination based on BIM. Development of parametrical models and libraries, and analysis of Green BIM and various applications of BIM Uses.

študije na osnovi informacijskih modelov stavb (za preverbo količin, analizo materialov, energetsko analizo).	

Temeljni literatura in viri / Readings:

Eastman, C.M. 2008. BIM Handbook, A Guid to Building Information Modelling. Boca Raton, CRC.
Krygiel E., Bnies, B. 2008. Green BIM, Practice Integrated Sustainable Design with BIM. John Wiley & Sons, Inc.
Levy, F. 2012. BIM in small-scale sustainable design. John Wiley & Sons, Inc.
Učno gradivo v spletni učilnici.

Cilji in kompetence:	**Objectives and competences:**
Cilji: – Pojasniti osnovne koncepte informacijskega modeliranja stavb. – Pripraviti študente na uvajanje in uporabo informacijskih modelov stavb. – Pripraviti študente na analize informacijskih modelov za trajnostno gradnjo stavb. Pridobljene kompetence: – Izdelati shemo informacijskih modelov stavb. – Izdelati konkreten informacijski model in pridobiti ustrezne podatke. – Uporaba informacijskih modelov stavb za vizualizacijo, dokumentacijo in analize. – Analitično obravnavati izmenjavo informacijskih modelov in vlogo pri komunikaciji. – Sposobnost sodelovanja z deležniki v projektu, ki temelji na informacijskih modelih stavb.	Objectives: – Student shall understand major concept relevant for building information modelling. – Student shall be capable to independently plan and implement BIM on small scale projects. – Student shall be capable to perform sustainable design and analysis based on BIM. Gained competences: – Understand and develop small BIM schema. – Independently develop and evolve BIM and gain appropriate data. – Understand and plan various BIM uses, including visualization, documentation, analysis. – Analytically observe the exchange BIM models and their role in project communication. – Capability to collaborate with different project stakeholders using BIM technologies.

Predvideni študijski rezultati:	**Intended learning outcomes:**
– Poznavanje teoretičnih osnov in standardov za BIM. – Poznavanje zahtev in postopkov za trajnostno projektiranje z BIM. – Razumevanja pomena in potenciala BIM. – Razumevanje kritičnih vsebin in elementov pri implementaciji BIM. – Sposobnost planiranja uporabe in implementacije BIM. – Sposobnost kritične presoje uvajanja BIM glede na zrelost sodelujočih in konkreten projekt. – Sposobnost analizirati in odpraviti ovire za interoperabilnost BIM. – Izdelki študentov: – delni informacijski modeli stavb s standardno – določenimi elementi,	– Theoretical background and standards for BIM. – Special requirements and procedures for sustainable design supported by BIM. – Importance and potential of BIM. – Critical digital content and elements for successful implementation of BIM. – Planning and implementation of BIM. – BIM assessments in terms of capability and capacity for implementation on a BIM project. – Analysis of interoperability issues and the related barriers. – Students shall produce: – partial BIM models with standards elements and BIM libraries, – analysis for sustainable design based on BIM, – integrated BIM project with all essential load-

– analize za trajnostno projektiranje na osnovi BIM, – integriran projekt BIM z vsemi bistveni elementi in izmenjavami modelnih vsebin.	bearing and non-load-bearing elements.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja sledijo problemsko naravnanemu delu na konkretnem projektu. Vsebine so delno posredovane v obliki multimedijskih gradiv.	Learning is supported by online learning content of management systems with interactive content. Student work is individual as well as in groups.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Sprotno delo: oddaja nalog	**50 %**	Course work and home-works
Pisni teoretični izpit	**30 %**	Written theoretical exam
Projekt	**20 %**	BIM Project

Reference nosilca / Lecturer's references:

CEROVŠEK, Tomo. A review and outlook for a 'Building Information Model' (BIM) : a multi- standpoint framework for technological development. Advanced engineering informatics, ISSN 1474-0346, 2011, letn. 25, št. 2, str. 224-244, ilustr., doi: 10.1016/j.aei.2010.06.003.
CEROVŠEK, Tomo, ZUPANČIČ-STROJAN, Tadeja, KILAR, Vojko. Framework for model-based competency management for design in physical and virtual worlds. Journal of information technology in construction, ISSN 1874-4753, 2010, vol. 15, str. 1-22, ilustr. http://www.itcon.org/2010/1.
CEROVŠEK, Tomo. BIM lifecycle // BIM FM. V: ANTÓNIO RUIVO, Meireles (ur.). 1st BIM International Conference : BIM Forum Portugal, 20. -21. 6. 2013. Porto: S. n., 2013, str. 1-57,ilustr.

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Projektiranje nosilnih konstrukcij stavb
Course title:	Design of building structures

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Stavbarstvo – druga stopnja MA		1	2
Buildings – second cycle MA		1	2

Vrsta predmeta / Course type:	Obvezni strokovni / obligatory professional
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
80		80	80		240	16

Nosilec predmeta / Lecturer:	prof. dr. Matej Fischinger, prof. dr. Franc Sinur, izr. prof. dr. Jože Lopatič, doc. dr. Sebastjan Bratina, izr. prof. dr. Janko Logar

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Obveznih pogojev ni, vendar delo brez osnovnega znanja statike in dimenzioniranja elementov iz različnih materialov praktično ni mogoče.	There are no mandatory prerequisites. However, without the basic knowledge how to calculate internal forces and how to proportion the elements made of different materials, the work (participation in the course) is practically impossible.

Vsebina:	**Content (Syllabus outline):**
Predavanja: Predavanja potekajo v več delih: Fischinger: Zasnova konstrukcij in potresno inženirstvo; Bratina: Projektiranje betonskih stavb; Sinur: Projektiranje jeklenih stavb; Lopatič: Projektiranje lesenih stavb; Logar: Geotehnično projektiranje. Pred začetkom izdelave projektnih nalog ter sproti med izdelavo nalog glede na specifične potrebe in želje študentov ter posebnosti vsakoletnega izbora obravnavanih stavb. Splošna uvodna predavanja obravnavajo: Osnovne principe zasnove konstrukcijskega sistema, najprej na splošno, nato pa z upoštevanjem specifike posameznih materialov (betona, prednapetega betona, jekla, sovprežnih rešitev jeklo/beton, lesa in zidanih izvedb). Pri tem je poudarek na	Lectures: Lectures are composed of five basic parts/courses: Fischinger: Conceptual Design and Earthquake Engineering; Bratina: Design of Concrete Buildings; Sinur: Design of Steel Buildings; Lopatič: Design of Timber Buildings; Logar: Geotechnical Design. Additional lectures, related to specific assignments/projects will be organized before the beginning of the work on the main project as well as during the work as required by the choice of the buildings, analysed each year ("just-in-time lectures"). General introductory lectures are composed of: Basic principles of conceptual design – first given in general, then specifically for different materials used (reinforced concrete, prestressed concrete,

povezavah med elementi ter delovanju konstrukcije kot celote. Principe izbire sistema temeljev in mehanizme njihovega delovanja. Zagotavljanje duktilnosti in principe načrtovanja nosilnosti potresno odpornih stavb. Predstavitev teoretičnih osnov za uporabljeno programsko opremo. Vaje: Za stavbo, ki je bila že prej zasnovana in obravnavana iz različnih drugih vidikov se preštudira in ovrednoti več različnih rešitev konstrukcijskih sistemov z možnostjo uporabe različnih materialov ali njihove sinteze ter več možnih načinov temeljenja. Pri tem se upošteva soodvisnost rešitev z drugimi bistvenimi zahtevami iz direktive o gradbenih proizvodih. Študentje/ke argumentirajo svojo izbiro in za izbrano varianto izdelajo podrobnejši projekt nosilne konstrukcije. Pri posameznih temah se najprej izdela nekaj preprostih domačih nalog, ki podajo oziroma utrdijo znanja iz konstruiranja.	steel, composite materials, timber, and masonry). The connections between the elements and the integrity of the structure are emphasized; The principles of choosing adequate foundation system and the mechanisms of their behaviour; Ductility and capacity design for earthquake- resistant structures; Theoretical background for the introduced computer programs. Tutorial: For building, which was previously addressed within the scope of other courses from other (non-structural) points of view, the students will study and evaluate: different structural systems; made from different materials or their combinations; different foundation systems. They will consider the interrelationship of different requirements given in the EU Construction Products Directive. The students should finally provide argumentation for their final choice and make the design project for the chosen system. Some simple additional assignments will be made to enhance the knowledge related to specific topics related to the main project.

Temeljni literatura in viri / Readings:

Beg, D. 1999. Projektiranje jeklenih konstrukcij po evropskem predstandardu ENV 1993-1-1. 2. UL, FGG.
O'Brien, E.J. 1995. Reinforced and Prestressed Concrete Design. Longman, 1995.
Thelanderson, S., Larsen, H.J. (urednika). 2003. Timber Engineering. John Wiley & Sons Inc.
Salgado, R. 2008. The Engineering of Foundations. Boston, McGraw-Hill.
EASY (Earthquake Engineering Slide Information System), IKPIR FGG, CD ali www.ikpir.fgg.uni- lj.si/EASY.

Cilji in kompetence:	**Objectives and competences:**
Cilji: – Razložiti in naučiti standardne postopke za zagotavljanje mehanske odpornosti in stabilnosti konstrukcij stavb iz različnih materialov (betona, jekla, lesa, zidov). – Razložiti in naučiti standardne postopke za zagotavljanje mehanske odpornosti in stabilnosti temeljev. – Upoštevajoč redne in izredne (potres, požar) vplive. Pridobljene kompetence: – Poznavanje prednosti uporabe posameznih konstrukcijskih materialov, oziroma njihove kombinacije pri izbiri optimalne zasnove konstrukcijskega sistema. – Razumevanje mehanizmov prenosa obtežbe preko konstrukcijskih sklopov v temeljna tla in	Objectives: – To present, explain and teach the procedures providing mechanical resistance and stability of building structures made of different materials (concrete, steel, timber, masonry) under standard and exceptional (earthquake, fire) loads. Gained competences: – The ability to choose the "optimum" structural system considering the advantages of different materials and their combinations. – The competence of understanding the load transfer through the structure into the foundation soil. – The competence of understanding the basic factors contributing to earthquake resistance of structures. – The ability to use computer software in the design

osnovnih principov zagotavljanja potresne odpornosti konstrukcij stavb. – Sposobnost uporabe računskih metod in programske opreme za projektiranje bolj zahtevnih nosilnih konstrukcij stavb in njihovih temeljev. – Poznavanje sodobnih IT podprtih orodij v projektiranju.	of more complex structural systems of buildings. – The ability to use the IT supported tools in design.
Predvideni študijski rezultati:	**Intended learning outcomes:**
– Razumevanje delovanja konstrukcijskih sklopov in konstrukcije kot celote ter prenosa obtežbe v temeljna tla. – Znanje določitve optimalnega sistema temeljenja. – Razumevanje dejavnikov za zagotavljanje duktilnosti in nosilnosti potresno odpornih konstrukcij in znanje oblikovanja ustreznih konstrukcijskih detajlov. – Sposobnost uporabe računskih metod in programske opreme za projektiranje bolj zahtevnih nosilnih konstrukcij stavb in njihovih temeljev. – Sposobnost identifikacije in kvantifikacije kritičnih obtežb. – Kompetentna uporaba evropskih standardov za projektiranje konstrukcij Eurokod. – Spoznanje, da je za uspešen projekt stavbe potrebno uravnoteženo izpolniti vseh šest bistvenih zahtev iz Direktive za gradbene proizvode in da h temu pripomore primerna izbira ter kombinacija gradbenih materialov. – Identifikacija in reševanje problemov, kritična analiza, argumentirana izbira med več možnostmi, sinteza, delo v skupini.	– Understanding the role of the structure and its subassemblies in the transfer of loads into the foundation soil. – The knowledge, how to choose a suitable foundation system. – Understanding of the key factors contributing to the ductility and strength of earthquake resistant structures. – The knowledge to choose and produce suitable structural details. – The use of the design methods and computer software for rather complex structural systems (including foundations). – The knowledge to identify and quantify critical loads on structures. – The knowledge of the competent use of the European standards for the design of structures – Eurocodes. – The students become aware that the successful design project of a building structure depends on the balanced consideration of all 6 basic requirements in the EU Construction Products Directive and on the balanced use of the advantages of different materials. – Transferable skills include: identification and solving of problems; critical assessment and analysis; argued choice between several options; ability of the synthesis; and working in a group.
Metode poučevanja in učenja:	**Learning and teaching methods:**
Predmet temelji na več sodobnih metodah poučevanja, kot so projektno učenje, delo v skupini, poučevanje s poudarkom na interesu študentov in podajanje vsebin v času, ko so potrebne za delo.	The course is based on several up-to-date teaching methods – project based learning, team work, student centred teaching and just-in-time lectures.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Sprotno delo: delo na seminarski nalogi in domačih nalogah	**50 %**	Course work and home-works
Zagovor izdelanih nalog	**50 %**	Presentation and argumentation of the project work.
Študentje, ki pri tem ne uspejo, imajo možnost poprave v obliki (pisnega) izpita		Unsuccessful students have an additional option in the form of a written exam.

Reference nosilca / Lecturer's references:

FISCHINGER, Matej, KRAMAR, Miha, ISAKOVIĆ, Tatjana. Ocena potresne varnosti armiranobetonskih montažnih hal z močnimi stiki (3) - kritična ocena postopkov projektiranja v EC8 in sklepne ugotovitve = Seismic safety evaluation of precast industrial buildings with strong connections (3) - critical evaluation of the design procedures in EC8 and concluding remarks. Gradbeni vestnik, ISSN 0017-2774, december 2008, letn. 57, št. 12, str. 323-329, ilustr.
REJEC, Klemen, ISAKOVIĆ, Tatjana, FISCHINGER, Matej. Seismic shear force magnification in RC cantilever structural walls, designed according to Eurocode 8. Bulletin of earthquake engineering, ISSN 1570-761X, apr. 2012, letn. 10, št. 2, str. 567-586, ilustr., doi: 10.1007/s10518-011-9294-y.
FISCHINGER, Matej, ISAKOVIĆ, Tatjana. Distance learning of structural engineering supported by information technology. Scientific journal on applied information technology, ISSN 1683-1373. [Online ed.], 2002, vol. 1, issue 1, str. [1-11], graf. Prikazi.

MOŽE, Primož, CAJOT, Luis-Guy, SINUR, Franc, REJEC, Klemen, BEG, Darko. Residual stress distribution of large steel equal leg angles. Engineering structures, ISSN 0141-0296. [Print ed.], 2014, letn. 71, št. jul., str. 35-47, ilustr. http://authors.elsevier.com/TrackPaper.html?trk_article=JEST4895&trk_surname=Moze, doi: 10.1016/j.engstruct.2014.03.040.
SINUR, Franc, MOŽE, Primož, REJEC, Klemen, LUŽAR, Gašper, BEG, Darko. Imperfection sensitivity of thin plates loaded in shear. Revue roumaine des sciences techniques, Série de mécanique appliquée, Applied mechanics, ISSN 0035-4074, jan- avg. 2014, št. 1-2, letn. 59, str. 121-139, ilustr. http://www.imsar.ro/RJTS-AM_2014_nr_1_2.pdf.
SINUR, Franc, BEG, Darko. Moment-shear interaction of stiffened plate girders -Tests and numerical model verification. J. Constr. steel res.. [Print ed.], jun. 2013, letn. 85, str. 116-119, ilustr., doi: 10.1016/j.jcsr.2013.03.007.

PLANINC, Igor, SCHNABL, Simon, SAJE, Miran, LOPATIČ, Jože, ČAS, Bojan. Numerical and experimental analysis of timber composite beams with interlayer slip. Engineering structures, ISSN 0141-0296. [Print ed.], 2008, letn. 30, št. 11, str. 2959-2969, ilustr. http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6V2Y-4SJ9G96-1&_user=4776866&_coverDate=05%2F19%2F2008&_alid=746911911&_rdoc=2&_fmt=high&_orig=search&_cdi=5715&_sort=d&_docanchor=&view=c&_ct=3&_acct=C000033658&_version=1&_urlVersion=0&_userid=4776866&md5=1a4f6278e7ed0d4b8a56c50c7c51ee6e, doi: 10.1016/j.engstruct.2008.03.007.
LOPATIČ, Jože, SAJE, Drago, SAJE, Franc. Creep of timber structures. International journal for engineering modelling, ISSN 1330-1365, 2005, vol. 18, no. 1/2, str. 1-10, ilustr. [COBISS.SI-ID 3621985]
ČAS, Bojan, LOPATIČ, Jože, SAJE, Miran, SCHNABL, Simon, PLANINC, Igor. Experimental and numerical analysis of composite wood beams : paper 199. V: TOPPING, Barry H. V. (ur.). Proceedings of the Tenth International Conference on Civil, Structural and Environmental Engineering Computing, Rome, Italy, 30 August-2 September 2005. Stirling [Scotland]: Civil-Comp Press, 2005, 26 str., ilustr.

MARKOVIČ, Mojca, KRAUBERGER, Nana, SAJE, Miran, PLANINC, Igor, BRATINA, Sebastjan. Non-linear analysis of pre-tensioned concrete planar beams. Engineering structures, ISSN 0141-0296. [Print ed.], jan. 2013, letn. 46, str. 279-293, ilustr., doi: 10.1016/j.engstruct.2012.08.004.
KRAUBERGER, Nana, BRATINA, Sebastjan, SAJE, Miran, SCHNABL, Simon, PLANINC, Igor. Inelastic buckling load of a locally weakened reinforced concrete column. Engineering structures, ISSN 0141-0296. [Print ed.], 2012, letn. 34, št. 1, str. 278-288, ilustr. http://drugg.fgg.uni-lj.si/3415/, doi: 10.1016/j.engstruct.2011.09.006.
BAJC, Urška, BRATINA, Sebastjan, SAJE, Miran, PLANINC, Igor. Nelinearna analiza razpokane armiranobetonske natezne palice - primerjava numeričnih metod = Nonlinear analysis of cracked tensile reinforced concrete bar - comparison of numerical methods. Gradbeni vestnik, ISSN 0017-2774, maj 2013, letn. 62, str. 105-116, ilustr. [COBISS.SI-ID 6260065]

ŠTRUKELJ, Andrej, ŠKRABL, Stanislav, ŠTERN, Ksenija, LOGAR, Janko. The assesment of pile shaft resistance based on axial strain measurements during the loading test. Acta geotechnica Slovenica, ISSN 1854-0171, 2005, letn. 2, št. 2, str. 12-23.
KUDER, Sebastjan, LOGAR, Janko. Numerični model za analizo obnašanja tlačno obremenjenih, vtisnjenih jeklenih pilotov v Luki Koper = Numerical model for the prediction of behaviour of driven steel piles under axial compression loading in the Port of Koper. Gradbeni vestnik, ISSN 0017-2774, avgust 2008, letn. 57, št. 8, str. 207-214, ilustr.
VOGT, Norbert B., SCHUPPENER, Bernd, WEISSENBACH, Anton, LOGAR, Janko. Projektni pristopi v Evrokodu 7-1 za geotehnično projektiranje v Nemčiji = Design approaches of EC 7-1 for geotechnical verifications used in Germany. Gradbeni vestnik, ISSN 0017-2774, oktober 2006, letn. 55, str. 254-261, ilustr.

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Požar
Course title:	Fire

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Stavbarstvo – druga stopnja MA		1	2
Buildings – second cycle MA		1	2

Vrsta predmeta / Course type:	Obvezni strokovni / obligatory professional
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30		30	30		90	6

Nosilec predmeta / Lecturer:	doc. dr. Tomaž Hozjan

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

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

Vsebina:	**Content (Syllabus outline):**
Predavanja: Splošno o požarnem inženirstvu. Pregled osnovnih pojmov. Evropski standardi in predpisi. Požarna obtežba. Modeli standardnih in realnih požarov. Ukrepi aktivne požarne zaščite. Evakuacijske poti, sistemi za javljanje in gašenje. Ukrepi pasivne požarne zaščite. Vpliv visoke temperature na lastnosti materialov. Temperaturno polje konstrukcije. Računsko ugotavljanje požarne odpornosti lesenih, armiranobetonskih in jeklenih nosilnih konstrukcij. Vaje: Laboratorijske vaje (računsko reševanje osnovnih nalog, obisk požarnega laboratorija). Seminarske vaje (izdelava požarnega elaborata za enostaven objekt)	Lectures: Introduction to fire engineering. Overview of basic concepts. European standards and regulations. Fire load. Models of standard and real fires. Measures of active fire protection. Evacuation routes, fire detection and fire fighting. Measures of passive fire protection. Influence of high temperatures on material behavior. Determination of temperature field in a structure. Computing determination of the fire resistance of timber, reinforced concrete and steel structures. Tutorial: Laboratory exercises (solving of basic tasks, visit of the fire laboratory). Seminar exercises (design of fire study for a simple building).

Temeljni literatura in viri / Readings:

Buchanan, A. H. 2005. Structural design for fire safety. John Wiley & sons ltd.
Wald F. et al. 2004. Vypočet požarni odolnosti stavebnih konstrukci, Tehniška univerza v Pragi.
Direktiva o gradbenih proizvodih, CPD 89/106, Bistvena zahteva št.2 "Požarna varnost".
Evrokod EN 1991-1-2 in požarni deli Evrokodov za lesene, armiranobetonske in jeklene konstrukcije.
Učno gradivo v spletni učilnici.

Cilji in kompetence:

Cilji:
- Nadgraditi osnovno znanje stavbarstva in konstrukterstva z načeli projektiranja požarno varnih stavb.
- Podati osnovne ugotovitve o nastanku, razvoju in poteku požarov v zgradbah in naravnem okolju.
- Seznaniti študente z modeli požarne obtežbe skladno z Evrokodom EN 1991-1-2 in z ukrepi aktivne in pasivne požarne zaščite.
- Privzgojiti občutek za pomen ukrepov požarne zaščite v luči sociooloških, naselitvenih, ekonomskih in drugih faktorjev.
- Povezati znanja iz drugih predmetov s požarnimi problemi.
- Vpeljati osnovna načela požarno varnega projektiranja lesenih, armiranobetonskih in jeklenih konstrukcij.

Pridobljene kompetence:
- Sposobnost ocene požarne ogroženosti objekta ter načrtovanja ukrepov požarne zaščite.
- Sposobnost izbire primernega modela požarne obtežbe. Sposobnost uporabe poenostavljenih računskih metod za oceno požarne odpornosti enostavnih nosilnih konstrukcij.
- Sposobnost izdelave požarnega elaborata za preproste objekte.

Objectives and competences:

Objectives:
- To upgrade the basic knowledge of architecture and design with principles of fire- resistant buildings.
- To provide the basic knowledge on the growth, development and progress of fires in buildings and natural environment.
- To familiarize students with models of fire load in accordance with EN 1991-1-2 standard and measures of active and passive fire protection.
- To obtain a sense of the importance of fire
- safety measures in the light of sociological, urban, economic and other factors.
- To relate knowledge from other courses with
- fire problems.
- To introduce the basic principles of fire safety design of timber, reinforced concrete and steel structures.

Gained competences:
- Ability to perform the fire safety assessment of a building and design fire protection measures
- Ability of selecting an appropriate fire load model. Ability to use the simplified calculation methods for the assessment of fire resistance of simple load-bearing structures.
- Ability to design fire study for simple objects.

Predvideni študijski rezultati:

- Razumevanje pomena požarnega inženirstva. Razumevanje fizikalnih osnov nastanka in razvoja požara ter vpliva visokih temperatur na materiale in konstrukcije.
- Znanje osnovnih metod in ukrepov aktivne in pasivne požarne zaščite.
- Uporaba pridobljenega znanja pri pripravi magistrskega dela in pri samostojnem ali skupinskem reševanju požarnih problemov na delovnem mestu v praksi.
- Povezava pridobljenega znanja z različnih

Intended learning outcomes:

- Understanding the importance of fire safety engineering. Understanding the physical basis of the growth and evolution of fire and influence of high temperatures on materials and structures.
- Knowledge of basic methods and measures of
- active and passive fire protection.
- Using the knowledge gained at this course in the preparation of the master thesis and when solving practical fire issue problems individually or in a group in practice.
- Link of the acquired knowledge from different

področij naravoslovja in tehnike s problemi požarnega inženirstva. Kritično ovrednotenje računskih modelov in poenostavitev v okviru standardov in predpisov. – Uporaba domače in tuje literature ter evropskih standardov in predpisov s področja požarnega inženirstva. Pridobivanje podatkov s svetovnega spleta, uporaba domačih in tujih baz podatkov. – Izdelava in uporaba preprostih računalniških orodij za reševanje požarnih problemov. – Uporaba razpoložljive programske opreme.	fields of science and technology with the problems of fire engineering. Critical evaluation of computational models and simplification in the context of standards and regulations. – Use of a domestic and foreign literature and European standards and regulations in the field of fire engineering. – Obtaining information from the World Wide Web, use of domestic and foreign databases. Development and use of simple computational tools for solving fire problems. – Use of the available software.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, laboratorijske vaje, seminarske vaje.	Lectures, laboratory exercises, seminar exercises.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Samostojno izdelana naloga	**50 %**	Seminar work
Ustni izpit	**50 %**	Oral exam

Reference nosilca / Lecturer's references:

KOLŠEK, Jerneja, PLANINC, Igor, SAJE, Miran, HOZJAN, Tomaž. The fire analysis of a steel- concrete side-plated beam. Finite elements in analysis and design, ISSN 0168-874X. [Print ed.], okt. 2013, letn. 74, str. 93-110, ilustr., doi: 10.1016/j.finel.2013.06.001.

HOZJAN, Tomaž, SAJE, Miran, SRPČIČ, Stane, PLANINC, Igor. Fire analysis of steel-concrete composite beam with interlayer slip. Computers & Structures, ISSN 0045-7949. [Print ed.], 2011, letn. 89, št. 1-2, str. 189-200, doi:10.1016/j.compstruc.2010.09.004.

HOZJAN, Tomaž, PLANINC, Igor, SAJE, Miran, SRPČIČ, Stane. Buckling of an axially restrained steel column under fire loading. International journal of structural stability and dynamics, ISSN 0219-4554, 2011, letn. 11, št. 3, str. 451-472, doi:10.1142/SO219455411004245

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Praktično usposabljanje
Course title:	Practical training

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Stavbarstvo – druga stopnja MA		1	2
Buildings – second cycle MA		1	2

Vrsta predmeta / Course type:	Obvezni strokovni / obligatory professional
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
6				80	34	4

Nosilec predmeta / Lecturer:	doc. dr. Andreja Istenič Starčič

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

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

Vsebina:	**Content (Syllabus outline):**
Študent se seznani in opravlja delo, ki ga opravlja diplomant tega študija v praksi. Predvsem: se seznani z organizacijsko strukturo in tehnologijo gradbenega podjetja, se seznani s predpisi o varstvu pri delu in njihovi izvedbi v praksi, de seznani se z aktualnim dogajanjem v gradbenem podjetju, spozna menedžerski vidik dela v podjetju, dela na terenu – aktualnem gradbišču, oziroma v pisarni - samostojno opravi dela na aktualnem projektu pod vodstvom mentorja, razvija uporabo znanstvenoraziskovalnih metod v širšem spektru problemov v stroki, razvija kritične refleksije, socialne in komunikacijske zmožnosti za vodenje skupinskega dela, pokaže iniciativnost in samostojnost pri vodenju najzahtevnejših delovnih sistemov pod nadzorom mentorja.	Student is introduced to the performance of work done by graduate in practice. Especially, students are: aware of the organizational structure and technology of building companies, familiar with the regulations about safety at work and their implementation in practice, familiar with current developments in a construction company, introduced to executive aspect of work when undertaking field work - current site, or in office - self- performed work on current project under the guidance of a mentor; they develop the use of scientific research methods in a broad spectrum of problems in the profession, develop critical reflection, social and communication skills for teamwork management, show initiative and independence in the management of most complex work systems under the supervision of mentor.

Temeljni 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. 2007. Ljubljana, UL. Dostopno na spletu.
Govekar, Okoliš et.al. 2010. Praktično usposabljanje študentov v delovnih organizacijah in primeri dobrih praks. Ljubljana, UL FF, Center za pedagoško izobraževanje.
Učno gradivo v spletni učilnici.

Cilji in kompetence:

Cilji:
- Študent v okviru praktičnega usposabljanja spozna operativno delo v ciljnih poklicih in organizacijsko strukturo subjektov na področju gradbeništva.
- Praksa, izvedena med izobraževalnim procesom, ima tudi motivacijski cilj ter namen.
- Študent spozna dejavnike kariernega načrtovanja in razvoja in procese povezane s kariernim razvojem.
- Študentu se omogoči samoevalvacijo kompetenc in dejavnikov, ki podpirajo procese poklicne identifikacije v povezavi akademskega okolja in delovnih okolij.
- Študent spozna značilnosti učenja na delovnem mestu in značilnosti delovnih okolij ter značilnosti opazovanja in registriranja delovnih procesov.

Pridobljene kompetence:
- Obvladovanje uporabe in prenosa teoretičnih znanj, ki jih študent pridobi med študijem pri predavanjih, vajah ter seminarjih, v inženirsko prakso.
- Sposobnost za povezovanje teorije in dela v praksi.

Objectives and competences:

Objectives:
- In the context of practical training student learns about operational work in targeted occupations and organizational structure of entities in the construction field.
- The practice during the educational process has also motivational goal and purpose.
- Students learn about the elements of career planning and development and processes related to career development.
- Student is facilitated to do self-evaluation of competences and factors that support the processes of professional identification in relation to academic environment and working environments.
- Students learn about the characteristics of workplace learning and the characteristics of working environments and the characteristics of observation of workflows.

Gained competences:
- Control of the application and transfer of theoretical knowledge acquired while studying in academic environment (lectures, tutorials and seminars) to engineering practice. Ability to integrate theory and practical work.

Predvideni študijski rezultati:

- Študent pridobi praktična znanja in izkušnje na področju nalog in storitev gradbene stroke.
- Pridobljena znanja mu koristijo pri izdelavi magistrskega dela.
- Študent se po opravljeni praksi lažje in hitreje uvaja v delo po končanem študiju, razume različne gradbene subjekte in njihovo vlogo v družbi.
- Študent se na podlagi sinteze pridobljenih znanj

Intended learning outcomes:

- Students will acquire practical knowledge and experience in the field of tasks and services of the construction field.
- Obtained knowledge will be useful in the preparation of master thesis.
- During the practice students are more efficiently introduced to the work needed after completing their studies, understand various construction entities and their role in society.

tekom študija lahko sooči z aktualnimi delovnimi nalogami oz. uporabi aktualna znanja in pripomočke pri izpolnjevanju nalog, ki jih opravlja organizacija, v kateri poteka praktično usposabljanje. – Pridobljena znanja in spretnosti pripomorejo h kakovostnejšemu razumevanje vsebin posameznih predmetov v študijskem procesu, tudi pri izdelavi magistrskega dela, kakor tudi kasneje pri uvajanju na prvo delovno mesto. Študent zna ovrednotiti svoje delo glede na zastavljene in dosežene cilje. Strokovno delo reflektira na osnovi zbranih informacij. Študent razvija kompetence za načrtovanje lastne kariere in samoevalvacijo znanja in kompetenc.	– Synthesis of knowledge acquired during the study may be confronted with the actual work and tasks through the application of core knowledge and tools in fulfilling the tasks carried out by the organization in which the practical training takes place. – Knowledge and skills to help achieve higher quality of comprehension of the content of individual courses in the study process, also in the writing of master thesis, as well as later in the introduction to the first employment. – Student is able to evaluate work against the objectives and targets achieved. Professional work is reflected on the basis of the information collected. Students develop competences for career planning and self-assessment of knowledge and competencies.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Terensko delo, mentorstvo, demonstracije, konzultacije, pisanje in vodenje dnevnika in portfolia prakse.	Field work, mentoring, demonstrations, consultations, writing and keep a diary and portfolio of practices.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Dnevnik prakse	**40 %**	Diary of practical work,
Portfolio	**30 %**	Portfolio
Ustni zagovor	**30 %**	Oral presentation
Predmet se ocenjuje z »opravil« / »ni opravil«		The course is assessed with "passed" /"not done"

Reference nosilca / Lecturer's references:

ISTENIČ STARČIČ, Andreja. Students' perception of field placement in professional competency and identity construction : transdisciplinary study in education, health and engineering. V: MILLWATER, Jan (ur.), EHRICH, Lisa Catherine (ur.), BEUTEL, Denise (ur.). Practical experiences in professional education : a transdisciplinary approach. Mt Gravatt: Post Pressed, 2011, str. 155-170, tabele.
ŠUBIC KOVAČ, Maruška, ISTENIČ STARČIČ, Andreja. Kompetence diplomantov gradbeništva - evropski raziskovalni projekt TUNING = Competences of graduates in civil engineering - the European Research Project TUNING. Gradb. vestn., julij 2006, letn. 55, str. 178-186, ilustr.
FOUCHAL, Farid, HASSAN, Tarek M., BLEICHER, David, ISTENIČ STARČIČ, Andreja. Industrialised, Integrated, Intelligent Construction Training Concept. V: WALLIS, Ian (ur.). Industrialised, Integrated, Intelligent Construction : I3con, Handbook 1. Berkshire: Bsria: I3con, 2009, str. 184-193.

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Napredni materiali
Course title:	Advanced materials

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Stavbarstvo – druga stopnja MA		2	3
Buildings – second cycle MA		2	3

Vrsta predmeta / Course type:	Obvezni strokovni / obligatory professional
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	0	30	30	0	90	6

Nosilec predmeta / Lecturer:	prof. dr. Boris Orel, doc. dr. Roman Kunič	
Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

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

Vsebina:	**Content (Syllabus outline):**
Predavanja: Korelacija med kemijsko strukturo in lastnostmi. Polimerni materiali s povišano temperaturno obstojnostjo in obstojnostjo na UV sevanje. Zaščita polimernih materialov pred pregrevanje: termotropne in termokromne prevleke, premazi z nizko termično emisivnostjo. Premazi s spremenljivo absorbpcijo, ”hladne” barve, radiacijsko hlajenje. Premazi in nanokompozitne prevleke z večfunkcionalnimi lastnostmi (antisoiling, self-cleaning), ”Trde” nanokompozitne prevleke. Uporaba pri sanaciji stavb in za varovanje kulturne dediščine. Optično prepustni polimerni materiali (PTFE, Mylar). Zaščita kovin proti koroziji z nanokompoziti (korozijski procesi, meritve propadanja, spektroskopija, itd). Hranilniki toplote (PCM). Pregled testnih metod za ugotavljanje obstojnosti materialov (pospešeni testi staranja). Ozelenjene strehe. Ogljični odtis, potencial globalnega segrevanja. Temeljenje na toplotni izolaciji. Patologija v gradbeništvu. Fotovoltaika,	Lectures: The correlation between chemical structure and properties. Polymer materials with a high thermal stability and resistance to UV radiation. Protection against overheating of polymeric materials: thermotropic and thermochromic coatings, coatings with low thermal emissivity. Coatings with changeable absorption, "cold" colors, radiant cooling. Coatings and nanocomposite coatings with multifunctional properties (antisoiling, self-cleaning), "Hard" nanocomposite coatings. Use the rehabilitation of buildings and for the protection of cultural heritage. Optical permeable polymeric materials (PTFE, Mylar). Protection against corrosion of metal nanocomposites (corrosion processes of decay measurements, spectroscopy, etc.). The storage tanks (PCM). Overview of test methods for determining the stability of the materials (accelerated aging tests). Green roofs. Carbon footprint, global warming potential (GWP). Foundations on thermal insulations. Construction

fototermika. Prezračevalni kolektorji. Vaje: Seminarske vaje (pregled eksperimentalnih postopkov za opredeljevanje lastnosti materialov). Spoznavanje procesov priprave nanokompozitnih prevlek in priprava premazov. Laboratorijske vaje (isto kot zgoraj).	pathology. Photovoltaic, Photothermics. Ventilated panels Tutorial: Tutorial (review of experimental procedures defining properties of materials). Understanding the process of preparation of nanocomposite coatings and coating preparation. Laboratory work (same as above).

Temeljni literatura in viri / Readings:

Orel, B., Šurca Vuk, A., Slemenik Perše, L. 2008. Sončni sprejemniki za pridobivanje sončne toplote: učno gradivo. Ljubljana: Kemijski inštitut.
Granqvist, C. G. (urednik). 1991. Materials science for solar energy conversion systems. Pergamon Press.
Peternelj, J., Jagličić, Z. 2014. Osnove gradbene fizike. UL, FGG.
e-učilnica Katedre za stavbe in konstrukcijske elemente na spletu: http://kske.fgg.uni-lj.si.
Raziskovalni laboratoriji in infrastrukturna centra. Dostopno na: http://www.ki.si/raziskovalne-enote/l02-laboratorij-zaspektroskopijo-materialov/.

Cilji in kompetence:	**Objectives and competences:**
Cilji: – Nadgraditi osnovno znanje o naprednih materialih uporabnih za doseganje toplotno-optičnih učinkov v stavbah. – Podati pregled njihovih fizikalno-kemijskih lastnosti v povezavi z strukturo materialov. – Nadgraditi znanje o njihovi uporabi z namenom načrtovanja večfunkcionalnih rešitev. – Podati pregled možnih rešitev v modernih stavbah. Pridobljene kompetence: – Sposobnost koncipiranja toplotno-optičnih rešitev za gradbeništvo na osnovi naprednih materialov. – Sposobnost razpoznavanja prednosti naprednih materialov na osnovi njihovih fizikalno-kemijskih lastnost.	Objectives: – Upgrade basic knowledge of advanced materials which are useful for achieve thermal-optical effects in buildings. – To give an overview of physical-chemical properties in relation to the structure of materials. – Upgrade knowledge about their use in order to design multifunctional solution. – To give an overview of possible solutions in modern buildings. Gained competences: – Ability of conception of thermo-optical solutions for construction on the basis of advanced materials. – Ability understanding of the benefits of advanced materials based on their physical -chemical properties.

Predvideni študijski rezultati:	**Intended learning outcomes:**
– Razumevanje delovanja transparentnih delov stavbnega ovoja, zasnova in analiza vplivov direktnega osončenja in zajema dnevne svetlobe v stavbi, sposobnost ocene odziva stavbe na osončenje in dnevno svetlobo. – Uporaba računskih metod in programske opreme za analizo obravnavanih elementov svetlobnega in (posredno) toplotnega odziva stavbe oziroma prostora. – Sposobnost samostojne ocene položaja in vloge	– Understanding the functioning of transparent constructional complexes, design and analysis of the effects of insolation and daylight in the buildings, ability to assess the building response to the insolation and daylight. – Application of calculation methods and computer software simulations for analyse of evaluated daylight and (indirectly) also thermal response of the buildings and surroundings. – Ability to independently evaluate the status and

obravnavnih elementov v sistemu okolje/človek/stavba in identifikacija medsebojnih povezav. – Spretnosti uporabe domače in tuje literature in drugih virov, zbiranja in interpretiranja podatkov, identifikacija. – Reševanje problemov, kritična analiza, sinteza, delo v skupini.	the role of the analysed elements in the system: environment/human/building, and identification of mutual interconnections. – Skills for review of relevant literature sources and other references (national, international), collecting and interpreting the data, problem identification. – Problem solving, critical analysis, synthesis, group work.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, laboratorijske vaje in seminarske vaje.	Lectures, laboratory exercises and seminar exercises.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Seminarske in laboratorijske vaje	**70 %**	Tutorial and laboratory work
Ustni izpit	**30 %**	Oral exam

Reference nosilca / Lecturer's references:

MOULKI, H., MIHELČIČ, Mohor, ŠURCA VUK, Angela, ŠVEGL, Franc, OREL, Boris, et al. Electrochromic performances of nonstoichiometric NiO thin films. V: BARBER, Zoe H. (ur.). European Materials Research Society (E-MRS) Spring Meeting 2013 Symposium O : synthesis, processing and characterization of nanoscale multi functional oxide films IV, May 27-31, 2013, Strasbourg, France, (Thin Solid Films, ISSN 0040-6090, Vol. 553, (Feb. 2014)). Strasbourg: [s. n.], 2014, vol. 553, str. 63-66, ilustr. http://ac.els-cdn.com/S0040609013017872/1-s2.0-S0040609013017872-main. pdf?_tid=6c861f3c-7dbd-11e3-8c82-00000aab0f6b&acdnat=1389774007_6135bc460e8d157d2a8e33b4d722d9e3, doi: 10.1016/j.tsf.2013.10.154.
KUNIČ, Roman, OREL, Boris, KRAINER, Aleš. An Assessment of the Impact of Accelerated Ageing on the Service Life of Bituminous Waterproofing Sheets. Journal of materials in civil engineering, ISSN 0899-1561, 2011, vol. 23, no. 12, str. 1746-1754, ilustr., doi: 10.1061/(ASCE)MT.1943-5533.0000326.
SLEMENIK PERŠE, Lidija, BIZJAK, Aleš, OREL, Boris. The role of rheological properties and spraying parameters on the spectral selectivity of Thickness Insensitive Spectrally Selective (TISS) paint coatings. Solar energy materials and solar cells, ISSN 0927-0248. [Print ed.], Mar. 2013, vol. 110, str. 115-125, doi: 10.1016/j.solmat.2012.12.009.

KUNIČ, Roman, TAVZES, Črtomir, KUTNAR, Andreja. Ogljični odtis toplotnoizolacijskih materialov v toplotnem ovoju stavb = Carbon footprint of thermal insulation materials in building envelopes. Gradbeni vestnik, ISSN 0017-2774, sep. 2012, letn. 61, str. 206-214, ilustr.
DOVJAK, Mateja, KUNIČ, Roman. Reševanje problemov urbanega toplotnega otoka in velike rabe energije z ozelenjenimi konstrukcijskimi sklopi stavb = Green building elements and the urban heat-island effect. AR, ISSN 1580-5573. [Tiskana izd.], 2011, [Št.] 2, str. 39-46, ilustr.
KUNIČ, Roman, KUTNAR, Andreja. Accelerated ageing and global warming potential of vip thermal insulation. V: BRUNNER, Samuel (ur.), WAKILI, Karim Ghazi (ur.). 11th International Vacuum Insulation Symposium : [proceedings, Dübendorf, September 19-20, 2013]. Dübendorf: Empa, 2013, str. 15-16.

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Učinkovita raba energije
Course title:	Efficient energy use

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Stavbarstvo – druga stopnja MA		2	3
Buildings – second cycle MA		2	3

Vrsta predmeta / Course type:	Obvezni strokovni / obligatory professional
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45		45	45		135	9

Nosilec predmeta / Lecturer:	doc. dr. Mitja Košir

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

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

Vsebina:	**Content (Syllabus outline):**
Predavanja: Metodologije za izračunavanje integrirane energijske učinkovitosti stavb: postopki, dimenzioniranje toplotne izolacije: stavba, konstrukcijski sklopi. Uporaba minimalnih zahtev glede energijske učinkovitosti novih in prenovljenih stavb. Energetska certifikacija stavb. Toplotni mostovi. Zaščita stavb pred pregrevanjem. Strategije in ukrepi za energetsko učinkovitost: stavba in konstrukcijski sklopi. Načini uporabe sončne energije v stavbah. Direktiva o energetski učinkovitosti stavb. Pravilnik o učinkoviti rabi energije v stavbah. Vaje: Seminarske vaje: računske metode za stacionarno in dinamično toplotno analizo konstrukcijskih sklopov in stavb. Laboratorijske vaje: individualne primerjalne analize toplotnega odziva na izbranih stavbah, z uporabo izbrane programske opreme.	Lectures: Methodology for the calculation of integrated energy performance of buildings: methods, sizing of thermal insulation on the level of building and individual constructional complexes. Requirements regarding minimum energy performance for new and renovated buildings. Energy certification of buildings. Thermal bridges. Overheating protection of buildings. Strategies and measures for energy efficiency: building and constructional complexes. Solar energy utilization in buildings. Directive on the energy performance of buildings. Regulations on energy efficiency in buildings. Tutorial: Tutorial: computational methods for stationary and dynamic thermal analysis of structural components and buildings. Laboratory work: analysis of thermal response of an individually selected building, using appropriate software.

Temeljni literatura in viri / Readings:

Szokolay, S. V. 2004. Introduction to architectural science: the basis of sustainable design. Oxford, Architectural Press.
Schittich, C. (urednik.). 2003. Solar Architecture: Strategies, Visions, Concepts. Birkhauser.
TSG-1-004, Tehnična smernica za graditev TSG-1-004 Učinkovita raba energije.
EN 13970 Thermal performance of buildings - Calculation of energy use for space heating and cooling".
e-učilnica Katedre za stavbe in konstrukcijske elemente na spletu: http://kske.fgg.uni-lj.si

Cilji in kompetence:

Cilji:
- Regulacija porabe toplotne energije za ogrevanje.
- Regulacija porabe toplotne energije za hlajenje.
- Upoštevanje vplivov oblike stavbe, orientacije in geometrije na porabo energije.
- Vpliv strukture zunanjega ovoja na varčno rabo energije.
- Izkoriščanjem obnovljivih virov energije v grajenem okolju.

Pridobljene kompetence:
- Obvladanje projektiranja in dimenzioniranja toplotne zaščite in zaščite pred pregrevanjem.
- Sposobnost uporabe predpisov in standardov s tega področja.
- Sposobnost uporabe ustrezne programske opreme za optimizacijo na ravni stavbe in njenega ovoja.

Objectives and competences:

Objectives:
- The objective of the course is to regulate heating energy consumption.
- The objective of the course is to regulate cooling energy consumption.
- The influence of building shape, orientation, geometry and envelope structure on the energy consumption is studied.
- Final objective is to enable efficient energy use and utilization of renewable energy sources in the built environment.

Gained competences:
- Students will master the design process with regard to thermal protection and protection of overheating of buildings.
- They will be able to use relevant rules and standards.
- They will be able to use as appropriate software tools for the optimization of energy performance of the entire building as well as its components.

Predvideni študijski rezultati:

- Sposobnost identifikacije vplivnih faktorjev, ki oblikujejo toplotni odziv stavbe in njenih konstrukcijskih sklopov z uporabo sodobnih metod načrtovanja, dimenzioniranja, izbora tehnologij in materialov. Razumevanje povezav med njimi in stopnje njihovih pomembnosti.
- Učinkovita koordinacija razpoložljivih materialov in tehnologij v stavbi, ki vplivajo na porabo toplotne energije.
- Sposobnost samostojne ocene položaja in vloge obravnavnih elementov v sistemu okolje/človek/stavba in identifikacija medsebojnih povezav.
- Spretnosti uporabe domače in tuje literature in drugih virov.
- Zbiranja in interpretiranja podatkov.
- Identifikacija in reševanje problemov, kritična analiza, sinteza, delo v skupini

Intended learning outcomes:

- Ability to identify influential factors that shape the thermal response of the building and its constructional complexes using modern methods of design, dimensioning, choice of technologies and materials.
- Understanding the links between them and their relative level of importance.
- Effective coordination between available materials and technologies in the building, which affect the use of heating energy.
- Ability to assess the situation and the role of individual elements in the environment / man / building system, as well as identification of interrelations.
- Ability to use national and international relevant literature and other sources.
- Collecting and interpreting data.
- Identification of problems and their solving, critical analysis, synthesis, group work.

Metode poučevanja in učenja:	Learning and teaching methods:
Predavanja, laboratorijske vaje in seminarske vaje. Projektni pristop.	Lectures, laboratory exercises and seminar exercises. Project oriented approach.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Ocena izdelka vaj	**70 %**	Project executed during tutorial and lab work
Pisni izpit	**30 %**	Written exam

Reference nosilca / Lecturer's references:

KOŠIR, Mitja, KRAINER, Aleš, DOVJAK, Mateja, PERDAN, Rudi, KRISTL, Živa. Alternative to the Conventional Heating and Cooling Systems in Public Buildings. Strojniški vestnik, ISSN 0039-2480, 2010, letn. 56, št. 9, str. 575-283, ilustr.

KOŠIR, Mitja, KRISTL, Živa, KRAINER, Aleš. Active control system based on the application of pasive solar architecture measures. V: ISES Solar World Congress 2011 : Rapid Transition to a Renewable Energy World : Proceedings, Avgust 28 - September 2, 2011, Kassel, Germanij. Kassel: International Solar Energy Society, 2011, str. 1-10.

KRISTL, Živa, KOŠIR, Mitja, TROBEC LAH, Mateja, KRAINER, Aleš. Fuzzy control system for thermal and visual comfort in building. Renew. Energy. [Print ed.], April 2008, št. 4, letn. 33, str. 694-702.

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Bivalno okolje
Course title:	Living environment

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Stavbarstvo – druga stopnja MA		2	3
Buildings – second cycle MA		2	3

Vrsta predmeta / Course type:	Obvezni strokovni / obligatory professional
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45		45	45		135	9

Nosilec predmeta / Lecturer:	doc. dr. Mitja Košir

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

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

Vsebina:	**Content (Syllabus outline):**
Predavanja: Fizični prostor, ergonomija, fiziologija človeka. Viri: geomorgologija, značilnosti podnebij, človek. Toplotno okolje: občutena temperatura, metabolizem, faktor obleke, adaptacija. Svetlobno okolje: vizualno udobje. Kvaliteta zraka: fiziološki minimum, emisije. Vlaga v stavbi, hrup, geneza bivalnega okolja, razvoj tehnologij, koncept bioklimatske orientacije. Zdrava stavba (SBS), primeri dobre prakse, aktualni primeri. Vaje: Seminarske vaje (uporaba znanja na konkretnem primeru v stavbi, oblikovanje koncepta, faktorska analiza, optimizacija sistema (sinteza). Laboratorijske vaje (simulacije odziva stavbe in prostora s pomočjo programske opreme).	Lectures: Physical active space, ergonomics, human physiology. Sources: geomorphology, climate type characteristics, human wellbeing. Thermal environment: thermal comfort, operative temperature, metabolic rate, effective clothing insulation, process of adaptation. Visual environment: visual comfort. Air quality: physiological minimum, pollutant emissions. Dampness related problems, noise issues, genesis of bioclimatic environment, technology development, concept of bioclimatic orientation. Healthy building (SBS), examples of best practice. Tutorial: Seminar work (application of knowledge on a case of a specific building, concept design, factor analysis, system optimization (synthesis)). Laboratory work (simulation of building response /active space response with computer software).

Temeljni literatura in viri / Readings:

McMullan, R. 2007. Environmental science in building. New York, Palgrave Macmillan.
Liddament, M.V. 1996. A guide to energy efficient ventilation, AIC-TN vent guide.
Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive (89/106/EEC).
e-učilnica Katedre za stavbe in konstrukcijske elemente na spletu: http://kske.fgg.uni-lj.si

Cilji in kompetence:

Cilji:
- Izboljšanje kakovosti grajenega okolja.
- Zmanjševanje negativnih vplivov na zunanje okolje.
- Učinkovita izraba virov.
- Zagotavljanje zdravega notranjega okolja za prebivalce.

Pridobljene kompetence:
- Pozna faktorje, ki vplivajo na bivalno in delovno okolje.
- Razume procese delovanja posameznih vplivnih faktorjev in njihovo interaktivnost.
- Sposoben je uporabljati računske metode in programsko opremo za področje oblikovanja notranjega okolja.
- Obvlada prenos sistema zunanje okolje-ovoj-notranje okolje človek v konceptualizacijo realne stavbe (navezovanje na ostale gradbeno-fizikalne vplive).

Objectives and competences:

Objectives:
- The main objectives of the course are to improve the quality of the built environment
- Minimization of negative impacts on the environment.
- Efficient use of natural resources.
- Providing healthy indoor environment for building occupants.

Gained competences:
- Student is familiar with influencing factors inside living and working environment.
- He understands the interactive impacts of defined influencing factors.
- He is able to use calculation methods and computer software for the design of healthy and comfort indoor environment.
- He masters the transfer between analysed systems: “outdoor environment- building envelope-indoor environment-human wellbeing” (in the framework of conceptualization of specific building case; link to other parameters of building physics).

Predvideni študijski rezultati:

- Razumevanje delovanja posameznih vplivnih faktorjev notranjega okolja na počutje in zdravje uporabnikov, sposobnost ocene odziva stavbe in uporabnikov na uporabljene ukrepe.
- Uporaba računskih metod in programske opreme za analizo obravnavanih elementov kvalitete notranjega okolja.
- Sposobnost samostojne ocene položaja in vloge obravnavnih elementov v sistemu okolje/človek/stavba.
- identifikacija medsebojnih povezav v sistemu okolje/človek/stavba.
- Spretnosti uporabe domače in tuje literature in drugih virov.
- Zbiranja in interpretiranja podatkov.
- Identifikacija in reševanje problemov, kritična analiza, sinteza, delo v skupini.

Intended learning outcomes:

- Understanding the functioning of the influencing factors of the internal environment on user health and comfort, the ability to evaluate the building and user response on the implemented measures.
- Application of calculation methods and computer software to analyse the evaluated elements of the indoor environmental quality.
- Ability to evaluate the status and role of analysed elements in the system “environment/human/building”.
- Identification of connections in the system “environment/human/building”.
- Skills for the review of relevant literature sources and other references (national, international).
- Collecting and interpreting the data.
- Problem identification, problem solving, critical analysis, synthesis, team work.

Metode poučevanja in učenja:	Learning and teaching methods:
Predavanja, laboratorijske vaje in seminarske vaje.	Lectures, laboratory exercises and seminar exercises.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Ocena izdelka vaj	**70 %**	Seminar and laboratory work.
Pisni izpit	**30 %**	Written exam

Reference nosilca / Lecturer's references:

DOVJAK, Mateja, KUKEC, Andreja, KRISTL, Živa, KOŠIR, Mitja, BILBAN, Marjan, SHUKUYA, Masanori, KRAINER, Aleš. Integral control of health hazards in hospital environment. Indoor + built environment, ISSN 1420- 326X, okt. 2013, letn. 22, št. 5, str. 776-795, ilustr.

KOŠIR, Mitja, KRAINER, Aleš, DOVJAK, Mateja, KRISTL, Živa. Automatically controlled daylighting for visual and nonvisual effects. Lighting research & technology, ISSN 1477-1535. [Print ed.], 2011, letn. 43, št. 4, str. 439-455, ilustr.

KOŠIR, Mitja, KRAINER, Aleš, DOVJAK, Mateja, PERDAN, Rudi, KRISTL, Živa. Alternative to the Conventional Heating and Cooling Systems in Public Buildings. Strojniški vestnik, ISSN 0039-2480, 2010, letn. 56, št. 9, str. 575-283, ilustr.

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Avtomatsko vodenje sistemov
Course title:	Automatic management of systems

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Stavbarstvo – druga stopnja MA		2	4
Buildings – second cycle MA		2	4

Vrsta predmeta / Course type:	Obvezni strokovni / obligatory professional
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45		15	30		90	6

Nosilec predmeta / Lecturer:	prof. dr. Borut Zupančič	
Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

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

Vsebina:	**Content (Syllabus outline):**
Predavanja: Sistemi: sistemski pristop, osnovni pojmi o sistemih, sistemski pristop pri načrtovanju vodenja. Modeliranje in simulacija: vrste modelov in načini modeliranja, ciklični postopek, vrednotenje in verifikacija, osnovni zapisi (dif. enačbe, prenosne funkcije in bločni diagrami). Objektno orientirano modeliranje, osnove simulacije, metode simulacije. Orodja: Matlab-Simulink, Dymola-Modelica. Modeliranje in simulacija toplotnih in svetlobnih tokov v zgradbi. Avtomatsko vodenje sistemov: inženirski pristop z bločnimi diagrami in tehnološkimi shemami. Osnovni pojmi (krmiljenje, regulacija, sledenje, odpravljanje motenj, učinki povratne zanke na ustaljeno stanje, stabilnost). Osnovne regulacijske strukture: stopenjski, PID, mehki regulator, avtomatsko vodenje toplotnih in svetlobnih tokov v zgradbi. Vaje: Laboratorijske vaje: delo s pomočjo modelersko	Lectures: Systems: systems approach, basic concepts, systems approach in control design. Modelling and simulation: types of models and modelling methods, cyclic procedures, validation and verification, basic forms (differential equations, transfer functions and block diagrams). Object oriented modelling, basics of simulation, methods of simulation. Tools: Matlab- Simulink, Dymola-Modelica. Modelling and simulation of heat and light processes in buildings. Automatic control: engineering approach with block diagrams and process schemes, basic concepts (open-loop and closed-loop control, disturbance reduction, closed-loop effects on steady state, stability). Basic control structures: step control, PID control fuzzy control, automatic control of heat and light in buildings. Tutorial:

simulacijskih paketov: Matlab-Simulink in Dymola- Modelica. Izvedba avtomatskega vodenja na modelnih laboratorijskih napravah. Seminar: vsak študent samostojno izdela seminarsko nalogo pod mentorstvom učitelja ali asistenta.	Laboratory work: work using modelling/simulation software: Matlab-Simulink and Dymola-Modelica. Application of automatic control on different laboratory plants. Tutorial: each student is required to conduct an individual seminar work under teacher's or assistant's supervision.

Temeljni literatura in viri / Readings:

Škrjanc, I. 2012. Avtomatsko vodenje sistemov. UL, FE. (skripta v pripravi)
Zupančič, B. 1996. Zvezni regulacijski sistemi 1. del, 3. Izdaja. UL, FE.
Zupančič, B., Karba, R., Matko, D. 1995. simulacija dinamičnih sistemov, 1.izdaja. UL, FE.
Karba, R. 1999. Modeliranje procesov, 1. Izdaja. UL, FE.
Oblak, R., Škrjanc, I. 2005. Matlab s simulinkom : priročnik za laboratorijske vaje, 1. izdaja. UL FE.

Cilji in kompetence:	**Objectives and competences:**
Cilji: – Prikaz področja avtomatike na zanimiv način preko številnih primerov. – Seznanitev s celovitostjo življenjskega cikla sistemov vodenja. – Poudarek na sistemskem pristopu. Pridobljene kompetence: – Osvojitev osnovnih metod modeliranja in simulacije sistemov. – Osvojitev osnovnih metod avtomatskega vodenja s poudarkom na regulacijskih metodah. – Seznanitev s celovitostjo obravnavanih postopkov s pomočjo primerov iz gradbeništva.	Objectives: – Introduction to the field of automatic control using interesting case examples. – Introduction to control life-cycles. – Emphasis on systems approach. Gained competences: – Mastering basic methods of system modelling and simulation. – Mastering basic principles of automatic control with emphasis on control methods. – Introduction to the integrity of presented procedures using examples from civil engineering.

Predvideni študijski rezultati:	**Intended learning outcomes:**
– Osnovna znanja iz modeliranja, simulacij in avtomatskega vodenja pretežno zveznih dinamičnih procesov, kot so procesi ogrevanja in osvetljevanja v zgradbah. – Znanja bodo pridobljena in demonstrirana ob številnih primerih, kar bo poudarilo uporabnostno komponento. – Poglobljeno razmišljanje s pomočjo sistemskega pristopa, ki je vodilo pri obravnavi, omogoča uporabo obravnavanih pristopov na podoben način tudi pri drugačnih problemih. – Sistemski pristop pri reševanju problemov. Modeliranje in simulacija bosta podana na način, ki bo demonstriran pretežno s problemi v gradbeništvu, vendar bo uporabnost dosti širša. – Metode vodenja bodo prav tako širše uporabne.	– Basic knowledge in modelling, simulation and automatic control of mainly continuous dynamic processes, such as heating and lighting processes in buildings. – The assessment and demonstration of the knowledge will be based on various case examples, emphasising its usability and applicability. – Concepts of in-depth thinking based on systems approach, allowing the use of the presented concepts in similar manner also on other areas. – Systems approach to problem solving. The methods of modelling and simulation will be presented using different examples from civil engineering, but with broader applicability. – Similarly, the presented methods of systems

Spoznana računalniška orodja za modeliranje, simulacijo in vodenje bodo gotovo uporabna tudi pri drugih predmetih.	control are also useful in a wider field of application. Presented software tools for modelling, simulation and control are useful for different lectures as well.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, laboratorijske vaje in seminarska naloga.	Lectures, laboratory exercises and seminar work.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Seminarsko in laboratorijsko delo	**70 %**	Seminar and laboratory work.
Pisni izpit	**30 %**	Written exam

Reference nosilca / Lecturer's references:

SODJA, Anton, ZUPANČIČ, Borut. Modelling thermal processes in buildings using an object-oriented approach and Modelica. Simulation modelling practice and theory, ISSN 1569-190X, Jul. 2009, vol. 17, no. 6, str. 1143-1159.

KARER, Gorazd, MUŠIČ, Gašper, ŠKRJANC, Igor, ZUPANČIČ, Borut. Self-adaptive predictive functional control of temperature in an exothermic batch reactor. Automatika, ISSN 0005-1144, 2009, god. 50, br. 1/2, str. 7-16.

TROBEC LAH, Mateja, ZUPANČIČ, Borut, KRAINER, Aleš. Fuzzy control for the illumination and temperature comfort in a test chamber. Building and environment, ISSN 0360-1323. [Print ed.], December 2005, letn. 40, št. 12, str. 1626- 1637.

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Pametna hiša
Course title:	Smart house

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Stavbarstvo – druga stopnja MA		2	4
Buildings – second cycle MA		2	4

Vrsta predmeta / Course type:	Obvezni strokovni / obligatory professional
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30		30	30		90	6

Nosilec predmeta / Lecturer:	doc. dr. Mitja Košir	
Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

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

Vsebina:	**Content (Syllabus outline):**
Predavanja: Geneza odnosa koncept – tehnologija. Interaktivnost vplivov na lokaciji. Sheme sistema pametne hiše: okolja, sistemi vedenja, stopnje vodenja, implementacija. Vloga individualnosti: zdravje, udobje, učinkovitost pri načrtovanju. Interaktivnost in povezanost prostora in časa s povezavo tega načela z informacijsko tehnologijo. Vpliv kulture in tehnologije, fiziologije in energije ter nove informacijske tehnologije na učinkovitost. Topologija komunikacij. Pametni proizvodi, podsistemi in avtomatizirano bivalno okolje. Vpliv dinamične odprtine in fasadni sistemi. Regulacija dnevne/umetne svetlobe. Pregled in kritična predstavitev aktualnih primerov. Vaje: Seminarske vaje: načrtovanje zasnove bivalnih stavb na osnovi izhodišč dinamičnega odziva na zunanje spremembe. Laboratorijske vaje:	Lectures: Relation between concept and technology. Interactivity of various influence factors on the building location. Schemes of smart house systems: environment, systems of user behaviour, regulation, implementation. Role of individuality in the process of design: health, comfort, efficiency. Space and time interactivity in the built environment and its integration with information technology. Impact of culture and technology, physiology, energy use issues and new information technology on the system performance. Topology of communications. Smart products, subsystems and automated living environment. Influence of dynamically regulated façade envelope. Daylight/artificial light control. Review and critical presentation of real life examples. Tutorial: Tutorial: strategies for the design of residential

individualne simulacije in primerjalne analize izbranih primerov stavb iz vaj.	buildings on the basis of dynamic response to outdoor conditions. Laboratory work: individual simulations and comparative analysis of the selected practical examples.

Temeljni literatura in viri / Readings:

Krainer, A. 1993. Toward smart buildings, (Building science and environment-conscious design, Module 1: Design principles, 7). London: European Commission.
Addington, M., Schodek, D. 2005. Smart Materials and Technologies. Elsevier, Architectural Press. (izbrana poglavja)
IEA (International Energy Agency). 1999. Solar Energy Houses, Strategies, Technologies, Examples, James&James.
Lee, E., Selkowitz, S., Bazjanac, V., Inkarojrit, V., Kohler, C. 2002. High-performance commercial building facades. Lawrence Berkley National Laboratory.
e-učilnica Katedre za stavbe in konstrukcijske elemente na spletu: http://kske.fgg.uni-lj.si .

Cilji in kompetence:	**Objectives and competences:**
Cilji: – Izboljšanje kakovosti bivalnega in delovnega okolja z razumno uporabo novih tehnologij in minimalno porabo energije za delovanje sistema. – Optimalna komunikacija z drugimi strokami in enakopravno sodelovanje s svojimi kompetencami z njimi. – Vodenja sistemov načrtovanja in gradnje, kjer se bo v praksi pojavil skupaj z arhitektom. Pridobljene kompetence: – Obvladanje osnovnih principov inženirskega načrtovanja. – Obvladanje postopka sistemske in faktorske analize. – Sposobnost uporabe različnih orodij za analizo in načrtovanje stavb. – Sposobnost uporabe literature in kritične presoje produktov razvoja stroke. – Sposobnost upoštevati tekočo zakonodajo in standarde.	Objectives: – The main objectives of the course are to improve the quality of the living and working environment with the rational use of new technologies and minimal use of energy for system operation. – Optimal communication with other experts with equal participation in their own field of competences. – Being able to design the framework of control systems of buildings. – Working in coordination with architect. Gained competences: – Mastering the basic principles of engineering design, mastering the processes of system analysis and factor analysis. – Ability to use calculation methods and computer software in the process of building design. – Ability to use relevant literature with critical evaluation of available products. – Getting familiar with current legislation from relevant filed.

Predvideni študijski rezultati:	**Intended learning outcomes:**
– Sposobnost identifikacije vplivnih faktorjev, ki oblikujejo dinamično in sonaravno bivalno okolje z razumno uporabo razpoložljivih tehnologij. Razumevanje povezav med njimi in stopnje njihovih pomembnosti. – Učinkovita koordinacija različnih strokovnih področij, ki se pojavljajo pri načrtovanju in gradnji stavb in aktivno sodelovanju na delu, ki	– Ability to identify the influencing factors for the design of dynamic and sustainable living environment with rational use of new technologies. Understanding the interconnections among them and the level of individual importance. – Efficient coordination of various fields influencing the design of buildings and construction, active

ga pokrivajo gradbeniške intervencije. – Sposobnost samostojne ocene položaja in vloge obravnavnih elementov v sistemu okolje/človek/stavba in identifikacija medsebojnih povezav. – Spretnosti uporabe domače in tuje literature in drugih virov. – Zbiranja in interpretiranja podatkov. – Identifikacija in reševanje problemov, kritična analiza, sinteza, delo v skupini.	participation in implementation of interventions. – Ability to evaluate the status and the role of elements in the "environment/human/building" system, identification of interconnections between them. – Skills for review of relevant literature sources and other references (national, international). – Collecting and interpreting the data. – Identification and solving of problems, critical analysis, synthesis, group work.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, laboratorijske vaje in seminarske vaje. Projektni pristop.	Lectures, laboratory exercises and seminar exercises. Project oriented approach.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Seminarsko in laboratorijsko delo	**70 %**	Seminar and laboratory work.
Pisni izpit	**30 %**	Written exam

Reference nosilca / Lecturer's references:

TOMAŽIČ, Simon, LOGAR, Vito, KRISTL, Živa, KRAINER, Aleš, ŠKRJANC, Igor, KOŠIR, Mitja. Indoor-environment simulator for control design purposes. Building and environment, ISSN 0360-1323. [Print ed.], Dec. 2013, vol. 70, str. 60-72, ilust.

KOŠIR, Mitja, KRAINER, Aleš, KRISTL, Živa. Integral control sistem of indoor environment in continuously occupied spaces. Automation in construction, ISSN 0926-5805. [Print ed.], 2012, letn. 21, št. 1, str. 199-209, ilustr.

KOŠIR, Mitja. Analiza regulacijskih sistemov bivalnega okolja v stavbah = Analysis of control systems for building performance. Gradbeni vestnik.

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Magistrsko delo
Course title:	Master thesis

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Stavbarstvo – druga stopnja MA		2	4
Buildings – second cycle MA		2	4

Vrsta predmeta / Course type:	Obvezni strokovni / obligatory professional
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
				270	270	18

Nosilec predmeta / Lecturer:	učitelj na študijskem programu / teacher at the study programme

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

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

Vsebina:	**Content (Syllabus outline):**
Magistrsko delo se izdela pod mentorstvom izbranega učitelja. Delo se javno predstavi ob zaključku študija. Vsebovati mora: – Uvod – Delovno hipotezo – Pregled virov – Material in metode – Rezultate – Razpravo – Povzetek Praviloma se v magistrskem delu obravnavajo praktični problemi s področja stavbarstva (predvsem na področju bistvenih zahtev št. 3, 4, 5 in 6) ter podajajo rešitve, do katerih pridejo s pomočjo študija in izsledkov lastnega raziskovalnega dela.	Master thesis shall be made under the supervision of a selected teacher. The work is presented in public at the end of the study. It must include: – Introduction – The working hypothesis – Overview of sources – Material and methods – Results – Discussion – Summary The thesis will ordinarily deal with practical problems from the area of buildings (mainly in the area of essential demands No. 3, 4, 5 and 6) that provide further solutions which come out from the study and from the results of students' own work.

Temeljni literatura in viri / Readings:

Literatura s področja vsebine diplomskega dela.
T. Koler-Povh, G. Turk: Navodila za oblikovanje visokošolskih del na FGG in navajanje virov, FGG UL, Ljubljana, 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

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:
- Uporabiti pridobljena znanja v poglobljenem študiju na temi magistrskega dela.
- Pod mentorstvom izdelati koncept dela, v katerem so opredeljeni namen, cilji, metode in viri za izdelavo tega dela.
- Razvijanje samostojnega, kritičnega in etičnega načina dela.

Pridobljene kompetence:
- Sposobnost samostojnega načrtovalskega in raziskovalnega dela.
- Sposobnost izdelave celovite in zaključene projektne in/ali raziskovalne naloge.
- Z javno predstavitvijo magistrskega dela pridobiti komunikacijske spretnosti in sposobnosti.

Objectives and competences:

Objectives:
- To use the knowledge gained by in-depth study on the thesis topic.
- Under supervisor's supervision student prepares a concept, where the purposes, goals, methods and references for the thesis are presented.
- To develop independent, critical and ethical way of working.

Gained competences:
- Ability to independent research and design.
- Ability to produce report about the executed design and/or research task.
- With public presentation student obtains communication skills and abilities.

Predvideni študijski rezultati:

- Pridobi znanja na vseh fazah, ki so del samostojnega reševanja konkretnih problemov in nalog na področju stavbarstva, sodelovanja in tudi skupinskega dela v okviru različnih subjektov na področju stavbarstva.
- Razume stavbarstvo kot interdisciplinarno panogo, vezano na ostale naravoslovne in tehniške vede in na okolje.
- Uporaba doseženega znanja v inženirski praksi.
- Raba teoretičnih znanj v praksi.
- Povezovanje ter inovativna dejavnost pri delu.
- Načrtovanje, izvedba in kritično vrednotenje pri reševanju.
- Reševanje problemov ter prezentacija izsledkov strokovnih nalog in raziskav.
- Sodelovanje, vključevanje strokovnjakov in skupno reševanje problemov.

Intended learning outcomes:

- Students acquire knowledge in all phases, which are part of a real problem and tasks in buildings, as well as cooperation and teamwork within various entities in the area of buildings.
- They understand the interdisciplinary of this area.
- They learn how to use the theoretical knowledge in engineering practice.
- Use of theoretical knowledge in practice.
- Connection and innovative activity at work.
- Planning, execution and critical evaluation in problem solving and presentation of results of technical tasks and research.
- Including, participation, involvement of experts and joint problem solving.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Samostojno delo, konzultacije.	Independent work, consultations.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Magistrska naloga	**50 %**	Master thesis
Javna predstavitev in zagovor	**50 %**	Public presentation and defence

Reference nosilca / Lecturer's references:

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Tehnologija instalacij
Course title:	Technology of installations

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Stavbarstvo – druga stopnja MA		1, 2	1, 3
Buildings – second cycle MA		1, 2	1, 3

Vrsta predmeta / Course type:	Izbirni strokovni / elective professional
Univerzitetna koda predmeta / University course code:	

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30		30	30		90	6

Nosilec predmeta / Lecturer:	prof. dr. Vincenc Butala

Jeziki / Languages:	**Predavanja / Lectures:**	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

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

Vsebina:	**Content (Syllabus outline):**
Predavanja: Uvod v vsebine, namen predmeta in program, kompetence. Notranje okolje v stavbah. Modeliranje notranjega okolja. Koncepti učinkovitih ter inovativnih sistemov za bivanje in delo uporabnika prostora, ter drugih namembnosti prostorov. Odziv uporabnika prostora na občutene parametre notranjega okolja – študija funkcij in modelov. Napredne tehnologije in sistemi za OPK in pripravo tople vode. Osnove regulacije in krmiljenja OPK sistemov za doseganje zahtevanih (želenih) parametrov v notranjih prostorih stavb. Osnove meritev in monitoring OPK sistemov. Reševanje problemov in osnovna načela projektiranja ter ocenjevanje kakovosti OPK sistemov. Vaje: Teoretične vaje (uporaba različnih modelov za analizo notranjega okolja, računanje posameznih parametrov notranjega okolja). Laboratorijske	Lectures: Introduction to topics, aims of the course and program, competences. Indoor environment in buildings. Indoor environment modelling. Concepts of efficient and innovative systems for occupant's living and working environment, and for other purposes of spaces. Occupant's response to the perceptible indoor environment parameters – studies of functions and models. Advanced technologies and systems for HVAC and hot water preparation. Fundamentals of regulation and feedback control of HVAC systems to achieve the required (desired) parameters in indoor spaces of buildings. Fundamentals of measurements and HVAC monitoring. Problem solving, planning fundamentals, and quality assessment of the HVAC systems. Tutorial: Theoretical exercises (use of different models for the analysis of indoor environment, calculating

vaje (spoznavanje z merilno opremo, meritev neposrednega notranjega okolja, demonstracijske vaje na laboratorijskem modelu klimatske naprave) Seminarski izdelek: Študent bo izbral vsebino, v smeri katere želi poglobiti svoje znanje. V sodelovanju z učiteljem bo izdelal seminar.	different parameters of indoor thermal environment). Laboratory work (learning about measuring equipment, direct measurement of indoor environment parameters, demonstration exercises on a laboratory model of air-conditioner). Seminar work: Students will choose the work task depending on individual requests to deepen their knowledge. In collaboration with teachers they will create seminar work.

Temeljni literatura in viri / Readings:

ASHRAE. 2007. ASHRAE Handbook: HVAC Application. Atlanta.
Mundt, E. et al. 2004. Ventilation effectiveness, REHVA Guidebook 2. Brussels.
Handbuch der Klimatechnik, Verlag C.F. Muller GmbH, Karlsruhe, 1989.
Wargocki, P. et al. 2006. Indoor climate and productivity in offices, REHVA Guidebook 6. Brussels.
Bilateral project. Thermal energy storage. Dostopno na: http://www.fs.uni-lj.si/los.

Cilji in kompetence:	**Objectives and competences:**
Cilji: – Podati osnove razumevanja in poznavanja notranjega okolja stavb (toplotno okolje, kakovost zraka) v korelaciji z uporabnikom prostora in strojnimi instalacijami. – Podati osnove povezave prostorske umeščenosti uporabnika prostora – človeka (npr. delovno okolje) z vrednotenjem notranjega okolja na podlagi osnovnih tehničnih zakonitosti in strojnimi instalacijami. – Podati osnovne tehnologije in osnove (sistemov) ogrevanja, prezračevanja in klimatizacije (hlajenja) (OPK) ter sistemov za pripravo tople vode. – Podati teoretične osnove regulacije OPK sistemov. Pridobljene kompetence: – Pridobljena znanja bodo omogočila, da bo študent: – Sposoben oceniti in osnovno načrtovati delovno in bivalno notranje okolje (toplotno okolje, kakovost zraka) s predvidenim tveganjem za ugodje in zdravje uporabnika prostora, – Sposoben osnovnega modeliranja parametrov notranjega okolja, – Sposoben prepoznati različne osnovne ogrevalne, prezračevalne in klimatske sisteme in sisteme za pripravo tople vode.	Objectives: – The main objective of this course is to make student understand the fundamentals of indoor environment in buildings (thermal environment and air quality) in correlation with the occupants and engineering installations. – To explain the fundamental relations of the occupant's position in a room (e.g. working environment) with indoor environment evaluation considering the fundamental technical requirements and engineering installations. – To explain the basics of technologies and heating, ventilation and air-conditioning systems as well as the fundamentals of hot water systems. – To explain the theoretical fundamentals of the HVAC system regulation. Gained competences: – Ability to estimate and prepare basic design of working and living environment (thermal environment, air-quality) with foreseen risk for the occupant's comfort and health risk. – Ability of basic modelling of the indoor environment parameters. – Ability to identify different heating, ventilation and air-conditioning systems and hot water systems.

Predvideni študijski rezultati:	**Intended learning outcomes:**
– Sposobnost razumevanja notranjega okolja v korelaciji z uporabnikom prostora in s tem povezanega delovanja OPK sistemov. – Uporaba pridobljenih znanj pri osnovnih analizah ocenjevanja notranjega okolja in ustreznosti vgrajenih OPK v inženirski praksi. – Pridobljena znanja so izjemno potrebna pri gradbenem inženirstvu. – Sposobnost logičnega razmišljanja in ustrezen inženirski pristop, ki vodi v kakovostno gradbeno aplikacijo. – Uporaba ustrezne literature, zbiranje in interpretacija podatkov, delna kritična analiza. – Sposobnost upoštevanja dinamike procesov pri načrtovanju in uporabe računalniških programov.	– Ability to understanding the indoor environment in correlation with occupants and HVAC system operating. – Application of acquired knowledge at fundamental indoor environment analysis and assessments and suitability of built-in HVAC systems. – Ability to think logically and take appropriate engineering approach which leads to high-quality application. – Using corresponding literature, collecting and interpreting data, critical analysis. – Ability to take into consideration the processes of dynamics at the planning and use of computers programs.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja, teoretične in laboratorijske vaje, samostojna izdelava individualnih nalog.	Lectures, theoretical and laboratory tutorial, individual work.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Seminar	**20 %**	Work
Laboratorijske vaje	**30 %**	Laboratory tutorial
Pisni izpit	**50 %**	Written exam

Reference nosilca / Lecturer's references:

MAZEJ, Mitja, BUTALA, Vincenc. Investigation in the characteristics of the personal ventilation using computational fluid dynamics. Indoor + built environment, ISSN 1420-326X, 2012, vol. 21, no. 6, str. 749-771, ilustr.

PREK, Matjaž, BUTALA, Vincenc. An enhanced thermal comfort model based on the exergy analysis approach. International journal of exergy, ISSN 1742-8297. [Print ed.], 2012, vol. 10, iss. 2, str. 190-208.

PREK, Matjaž, BUTALA, Vincenc. Principles of exergy analysis of human heat and mass exchange with the indoor environment. International journal of heat and mass transfer, ISSN 0017-9310. [Print ed.], Dec. 2010, vol. 53, iss. 25/26, str. 5806-5814.

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Izbrana poglavja gradbene informatike
Course title:	Selected chapters from building informatics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Stavbarstvo – druga stopnja MA		1, 2	1, 3
Buildings – second cycle MA		1, 2	1, 3

Vrsta predmeta / Course type: Izbirni splošni / elective general

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45		45			90	6

Nosilec predmeta / Lecturer: prof. dr. Žiga Turk

Jeziki / Languages:		
	Predavanja / Lectures:	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

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

Vsebina:	**Content (Syllabus outline):**
Predavanja: Vloga gradbene informatike; definicija gradbena informatika in njena zgodovina. Specifični problemi gradbene informatike o modeli in paradigme trajnostnega načrtovanja in vloga IT, vloga in mesto informatike v gradbenem podjetju in družbi. Tematski zemljevid gradbene informatike, modeliranje kot metoda reševanja problemov. Računalniško integrirana graditev komunikacijska integracija o informacijska integracija, procesna integracija o povezovanje znanja. Računalniško integrirana graditev, sočasno inženirstvo (concurrent) engineering, virtualna podjetja, eDelo, ePoslovanje. Česa računalniki ne zmorejo. Uvajanje informatike v podjetja, strateški vidiki informatizacije na področju gradbeništva. Načrtovanje in razvoj programske opreme, objektni in relacijski model, okolja programov (operacijski sistem, drug program, mobilna naprava, splet), reinženiring poslovnih procesov in uvajanje IT o gradbena informatika kot poklicna priložnost.	Lectures: The role of construction informatics; the definition of ITC and its history. The specific problems of construction informatics; the models and paradigms of sustainable design and the role of IT. The role of IT in construction company and society. Thematic map construction informatics modeling as a method of problem solving. Computer integrated construction; integration of communication. Information Integration; the integration process; the integration of knowledge. Computer-integrated construction; concurrent engineering; virtual enterprises; eWork; eBusiness; what computers are not able to do. The introduction of information technology in enterprises. The strategic aspects of information in the field of sustainable construction; design and development of software; object oriented and relational model; software and its working context (operating system, another program, mobile device, web); reengineering of process transactions and the introduction of IT. ITC as a

Vaje: Posamezne vaje in seminar iz računalniško integrirane graditve in uporabo orodij na projektnem problemu.	career opportunity. Tutorial: Individual exercises and seminar in computer integrated sustainable construction and use of tools in project problem.

Temeljni literatura in viri / Readings:

Zarli, A. et al. 2004. Building a Better Future, eBook, ICCI Consortium.
Deutsch, R. 2011. BIM and integrated design: Strategies for architectural practice. John Wiley & Sons.
Eastman, C. et al. 2011. BIM handbook: A guide to building information modeling for owners, managers, designers, engineers and contractors. John Wiley & Sons.
Raphael, B., Smith, I.F.C. 2003. Fundamentals of computer-aided engineering. John Wiley & Sons.
Turk Ž, Izbrana poglavja iz gradbene informatike.
Učno gradivo v spletni učilnici.

Cilji in kompetence:	**Objectives and competences:**
Cilji: – Spoznati pomen informatike kot povezovalnega gradnika med subjekti gradbene industrije in procesi, ki v njej potekajo. – Spoznati osnovno teoretično in tehnološko ozadje rešitev problema povezovanja v industriji. – Poglobiti razumevanje o neposrednih in strateških vidikih informatizacije v gradbeništvu. – Postaviti konceptualni okvir tematik gradbene informatike, ki ga bodo v toku študija na smeri izpopolnili drugi predmeti. – Razumeti pomen specialistovega področja v gradbeni industriji in z njo povezanih panogah. Pridobljene kompetence: – Sposobnost strateškega in kritičnega razmišljanja o uporabi informacijskih tehnologijah v gradbeništvu. – Sposobnost uporabe tehnoloških rešitev.	Objectives: – Understand the importance of information technology as an integrating element among the entities of the construction industry and its processes. – Recognize basic theoretical and technological backgrounds for the solutions of connecting the industry. – To deepen the understanding of the direct and strategic aspects of informatization in construction. – Establish a conceptual framework of themes and topics of construction informatics, which will be (in the course of study) completed by other courses – Understand the importance of information specialists in the field of construction industry and related industries. Gained competences: – Ability of strategic and critical thinking about the use of information technology in construction. – Ability to use technological solutions, software. – Ability to take part in information technology planning and development.

Predvideni študijski rezultati:	**Intended learning outcomes:**
– Vloga informatike v družbi nasploh in v gradbeništvu posebej. – Pregled nad temami gradbene informatike. – Strateški vidiki informatizacije na področju gradbeništva. – Razumevanje znanstvenih metod dela v gradbeni informatiki. – Raba ključnih orodij za delo in učenje na daljavo. – Uporaba znanstvenih metode pri informatizaciji procesov v gradbeništvu. – Kritična analiza uporabe IKT v gradbeništvu. – Sposobnost uporabiti metode znanstvenega dela v okviru gradbene informatike tudi na druga področja. – Sposobnost sistematične analize uporabe informacijskih tehnologij. – Sposobnost organiziranja IKT podpore projektom. – Sposobnost postati informacijski manager (CIO) projekta.	– The role of information technology in society in general and in construction in particular. – Overview of the topics of construction informatics. – Strategic aspects of information in the field of construction. – Understanding of scientific methods in construction informatics. – Use of key tools for distance working and distance learning. – Use of key tools for the three kinds ofintegration (information-knowledge, process, communication). – Critical analysis of the use of ICT in construction – Ability of systematic analysis of the use of information technologies. – Ability to organize ICT project support. – Ability to become an IT manager (CIO) of a project, BIM manager of a project. – Ability to be involved in software development projects.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Predavanja z diskusijo s študenti. Vaje in demonstracije v šoli. Samostojno delo s korekturami doma.	Lectures including discussion with students. Distance lectures. Project based leaning. Teamwork.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Teoretično znanje na izpitu	**40 %**	Theoretical exam
Sodelovanje na vajah in predavanjih	**20 %**	Activity and collaboration
Projekt in izdelek	**40 %**	Project work quality

Reference nosilca / Lecturer's references:

MEŽA, Sebastjan, TURK, Žiga, DOLENC, Matevž. Component based engineering of a mobile BIMbased augmented reality system. Automation in construction, ISSN 09265805. [Print ed.], jun. 2014, letn. 42, št. X, str. 112, ilustr. http://www.sciencedirect.com/science/article/pii/S0926580514000363, doi: http://dx.doi.org/10.1016/j.autcon.2014.02.011.

TODOROVIĆ, Miloš, TURK, Žiga. Upoštevanje trajnostnih kriterijev pri projektiranju z orodjem BIM = Designing using sustainability criteria with BIM tools. Gradbeni vestnik, ISSN 00172774, okt. 2011, letn. 60, št. 10, str. 279284, ilustr.

KLINC, Robert, TURK, Žiga, DOLENC, Matevž. Engineering collaboration 2.0 : requirements and expectations. Journal of information technology in construction, ISSN 18744753, 2009, letn. 14, pos. št., str. 473488, ilustr. Dostopno na: http://www.itcon.org/2009/31.

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Športna vzgoja
Course title:	Physical education

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Stavbarstvo – druga stopnja MA		1, 2	2, 3
Buildings – second cycle MA		1, 2	2, 3

Vrsta predmeta / Course type: Izbirni splošni / elective general

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
5		40			45	3

Nosilec predmeta / Lecturer: prof. dr. Branko Škof

Jeziki / Languages:	
Predavanja / Lectures:	slovenski / Slovene
Vaje / Tutorial:	slovenski / Slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Zdravstveni status, ki dovoljuje ustrezen telesni napor.	Health status, which allows appropriate physical exercise.

Vsebina:	**Content (Syllabus outline):**
Predavanja Splošni teoretični del vsebuje predavanja, ki so skupna vsem športnim programom in se izvajajo skupno za vse študente (osnove delovanja človekovega telesa, njegovega gibalnega, srčno žilnega in dihalnega sistema, psihomotorične in funkcionalne sposobnosti, športno-gibalna aktivnost kot preventivna in kurativna dejavnost za ohranjanje in utrjevanje zdravja, osnove zdravega prehranjevanja in regulacije telesne teže ter drugih medicinskih vidikov športa, metode preverjanja in ugotavljanja stanja psihomotoričnih in funkcionalnih sposobnosti). Specialni teoretični del je vezan na izbrano športno panogo (posebnosti športne panoge, njen vpliv na človeka, tehnika, taktika in pravila, osnove telesne in tehnično taktične priprave) in se izvaja skozi praktične vaje; Praktične vaje Študent izbira med ponujenimi športnimi panogami. Za vsako panogo se izvaja program učenja, izpopolnjevanja znanja in osnovnega	Lectures General theoretical part contains lectures, which are common to all sports programs made collectively for all students (basic function of the human body, movement of the body and cardiovascular system, psychomotor and functional abilities, prevention and curative activity for developing health, basic nutrition and healthy diet, regulation of body weight and other medical aspects of sports, checking methods and assessment of psychomotor and functional abilities). Special theoretical part is linked to the selected sport (specificity of sport, human development through sport, technique, tactics and rules, fundamentals of physical and technical preparation) and is implemented through practical exercises; Practical work Students choose between the offered sport branches. For each sport have a program of learning and skill training.

treniranja. Poleg izbrane športne panoge bo študent moral opraviti 5 vodenih enodnevnih ali večdnevnih športnih aktivnosti v naravi, ter preizkus motoričnih in funkcionalnih sposobnosti.	Students have to do: five guided multi-day sports activities in nature and aerobic endurance test.

Temeljni literatura in viri / Readings:

Škof, B. 2012. Does physical activity at a young age really mean a healthier adulthood and old age? Annales kinesiologiae, ISSN 2232-2620, 2012, vol. 3, no. 2, str. 149-166.
Škof, B. 2010. Spravimo se v gibanje - za zdravje in srečo gre: kako do boljše telesne zmogljivosti slovenske mladine? Ljubljana, Fakulteta za šport UL, Inštitut za šport, 253 str.
Škof, B. et at., 2007. Šport po meri otroka in mladostnika. Ljubljana, Fakulteta za šport UL, Inštitut za šport, 445 str.
Berčič, H. et at. 2007. Šport v obdobju zrelosti. Fakulteta za šport UL, Inštitut za šport, 240 str.
Škof, B., Zabukovec V., Boben, D., Cecič Erpič S., 2005. Pedagoško-sociološki vidiki športne vzgoje. Ljubljana, Fakulteta za šport UL, Inštitut za kineziologijo, 237 str.

Cilji in kompetence:	**Objectives and competences:**
Cilji - odpravljanje in preprečevanje posledic pomanjkanja gibanja oz. skrb za izboljšanje psihofizičnih sposobnosti, krepitev zdravja in ustvarjalno izrabo prostega časa. - ozaveščanje o vrednotah športa in preko tega vplivanje na oblikovanje pozitivnih stališč do športa in navajanje na zdrav način življenja - izpopolnjevanje znanja v izbrani športnih panogah - oblikovanje trajnega aktivnega odnosa do športa kot kompenzacijske dejavnosti k študiju in delu Kompetence - oblikovanje trajnega pozitivnega odnosa do športne dejavnosti in trajne skrbi za ohranjanje zdravja in delovnih sposobnosti, - racionalno vgrajevanje športa v način življenja, - sposobnost samostojne skrbi za zdrav način življenja skozi športno-gibalno aktivnost, - pripravljenost in sposobnost samostojnega vključevanja v organizirane ali neorganizirane oblike športnega udejstvovanja v novih študijskih ali delovnih okoljih, - promocija in uveljavljanje fakultete in univerze.	Objectives - care for improving psychophysical abilities, health strength and creative use of free time - raising awareness about the values of sports, encouraging a positive attitude to sports and healthy way of lifestyle - perfecting knowledge in selected sports - encouraging positive attitude to sport as a compensatory activity to study and work Competences - formed positive attitude towards sports activities and permanent concern for the preservation of health and working ability. - rational incorporation of sports into lifestyle, - understand the concern for a healthy lifestyle through sports and physical activity, - readiness and ability of self-depended inclusion in organized or non-organized forms of sports in the new study or work environments, - promotion and recognition of the Faculty and University.

Predvideni študijski rezultati:	**Intended learning outcomes:**
- razumevanje temeljnih pojmov in teorij delovanja človekovega gibalnega, srčno žilnega in dihalnega sistema ter njihovih najpogostejših patologij - oblikovanje razumskega in čustvenega odnosa	- understanding the basic concepts and theories of human locomotion, cardiovascular and respiratory systems and their most frequent pathologies in relation to mental health - creation of rational and emotional attitude

do telesnega napora, poznavanje teorije aktivnega počitka in metod za regeneracijo telesa, poznavanje zdravega prehranjevanja in regulacije telesne teže. Izpopolnitev znanja izbranih športnih zvrsti - uporaba pridobljenih znanj in vedenj v vsakodnevnem življenju za kompenzacijo negativnih učinkov enostranskih obremenitev v času študija -skozi pridobljena znanja in vedenja zagotovitev večje kvalitete življenja in večje učinkovitosti pri študiju in delu - psihofizična pripravljenost organizma je pogoj za reševanje vsakodnevnih obveznosti in nalog.	toward physical effort, knowledge of the theory of active rest and methods for body regeneration, knowledge of healthy diet and body weight regulation, - improvement of knowledge in selected sport. Use of acquired knowledge and skills in daily life to compensate daily stresses and negative effects of unilateral load during the study, - through the acquired knowledge and behaviour increased quality of life and increased efficiency of study and work are ensured, - good psychophysical preparedness is a condition to solve everyday duties and obligations.

Metode poučevanja in učenja:	**Learning and teaching methods:**
Pouk se izvaja v pokritih športnih objektih in v naravi v obliki predavanj in vaj, skupinskih in individualnih konzultacij kontinuirano preko celega semestra, pa tudi v zgoščenih (kurznih) oblikah, vendar z enakim fondom ur, pri čemer se večji del teorije podaja skozi praktične vaje. Uporablja se naslednje učne oblike: frontalna, individualna, delo v manjših skupinah.	Activities are implemented in indoor sports facilities and the natural environment in the form of lectures and exercises, group and individual consultations through the whole semester as well as in concentrated forms, major part of theory is performed through practical exercises. Learning forms: frontal, individual, small group work.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Teoretični izpit	**20 %**	Theoretical exam
Praktični izpit	**80 %**	Practical exam

Reference nosilca / Lecturer's references:

AUERSPERGER, Irena, ŠKOF, Branko, LESKOŠEK, Bojan, KNAP, Bojan, JERIN, Aleš, LAINŠČAK, Mitja. Exerciseinduced changes in iron status and hepcidin response in female runners. PloS one, 2013, vol. 8, issue 3, tabele, graf. prikazi, [8 str.]

PLEVNIK, Matej, PIŠOT, Rado, ŠKOF, Branko. The effects of a six-month training programme on running endurance, morphological characheristics [!] and some aerobic ability parameters of adult women with different physical abilities = Vpliv šestmesečnega vadbenega programa na tekaško vzdržljivost, morfološke značilnosti in nekatere kazalce aerobne zmogljivosti odraslih žensk z različno začetno zmogljivostjo. Ann. Kin. (Koper, Tisk. Izd.), 2012, vol. 3, no. 2, str. 181-195.

AUERSPERGER, Irena, KNAP, Bojan, JERIN, Aleš, BLAGUS, Rok, LAINŠČAK, Mitja, SKITEK, Milan, ŠKOF, Branko. The effects of 8 weeks of endurance running on hepcidin concentrations, inflammatory parameters and iron status in female runners. Int. J. sport nutr. Exerc. Metab. (Print), 2012, vol. 22, issue 1, str. 55-63.