

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Angleški jezik – nivo A

Course title: English, level A

Študijski program in stopnja

Študijska smer

Letnik

Semester

Study programme and level

Study field

**Academic
year**

Semester

Visokošolski strokovni študijski program računalništva in informatike, 1. stopnja	ni smeri	2, 3	poletni
Professional study program Computer and Information Science, 1st cycle	none	2,3	spring

Vrsta predmeta / Course type

izbirni predmet /elective course

Univerzitetna koda predmeta / University course code:

63745

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
30	/	15	/	/	/	3

Nosilec predmeta / Lecturer:

lekt. mag. Nina Bostič Bishop

Jeziki /

Languages:

Predavanja /

Lectures:

slovenščina in angleščina
Slovene and English

Vaje / Tutorial:

slovenščina in angleščina
Slovene and English

Prerequisites:

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

Vsebina:

Slovnica:

- časi;
- predlogi;
- tvorba vprašanj;
- modalni glagoli;
- predložne zveze;
- števila in števnik;
- pasiv;
- pogojniki;
- frazni glagoli.

Besedišče:

- prvi kontakti in predstavljanje;
- vljudnostne fraze;
- izmenjava informacij;
- predstavitev podjetja in dejavnosti;
- jezik poslovnih predstavitev;
- korespondenca in telefoniranje;
- dogovori in zmenki.

Content (Syllabus outline):

Grammar:

- tenses;
- prepositions;
- forming questions;
- modal verbs;
- prepositional phrases;
- numbers, presentation of figures in charts and graphs;
- passive voice;
- conditionals and temporary clauses;
- phrasal verbs.

Vocabulary:

- first encounters;
- phrases and exchanging information;
- presentations;
- correspondence and telephoning;
- meetings and reports;
- quoting what people think and what they have said.

Temeljni literatura in viri / Readings:

1. Williams A. in Pile L. (2002) Pass Cambridge, BEC Vantage. Summertown Publishing: Oxford.
2. Badger I. (2006). English for work. Longman: Edinburgh.
Dodatna literatura:
3. Anderson K. (2004). Study speaking. Cambridge University Press: Cambridge.
4. Štros M. (2006). English correspondence. Babylon d.o.o.: Ljubljana.
5. Brieger, N. In Pohl, A. (2002). Technical English Vocabulary and Grammar. Summertown: Summertown Publishing Limited.
6. EVROTERM. Večjezična terminološka baza izrazov Evropske unije. Dostopno na: <http://www.sigov.si/evroterm>.
7. Cambridge Dictionary Online. Dostopno na <http://dictionary.cambridge.org>.

Cilji in kompetence:

Cilj predmeta je poglobiti splošno jezikovno znanje študentov ter jih seznaniti z jezikom stroke oz. osnovno strokovno terminologijo glede na študijsko smer. Pri predmetu se bodo študenti seznanili s spremembami in novostmi v angleškem jeziku, korespondence in pri predstavitev. Študenti bodo spoznali tudi strukturo fakultete (nazive laboratorijev, smeri, predmetnika) v tujem jeziku ter razvili bralno razumevanje strokovnih besedil in utrdili pripravo povzetkov vsebine v angleščini. Poleg tega bodo razvili tudi specifične poslovne komunikacijske veščine (telefoniranje, elektronska pošta, neformalni pogovori, predstavitev naloge oz. referata, predstavitev oddelka ali laboratorija, pisanje C.V.-ja in spremnega pisma, priprava na razgovor za delovno mesto).

Objectives and competences:

Main goal is to:

- expand general knowledge of English and introduce the terminology used in the field of computer science;
- inform students about changes in English language, correspondence and new trends in presentation techniques;
- familiarise students with vocabulary necessary for describing their study, faculty and university;

develop strategies for business communication i.e. telephoning, correspondence, presentation, writing CV.

Predvideni študijski rezultati:

Znanje in razumevanje:

Predmet bo študentom omogočil:

- utrditi in razširiti splošno in strokovno znanje angleškega jezika;
- samostojno učenje jezika in uporabo različnih virov (slovarji, učbeniki, časopisi in revije, spletne strani, ipd);
- pisanje povzetkov besedil;
- brati, analizirati in razumeti različna avtentična strokovna besedila;

Intended learning outcomes:

Application: to recognise and understand the meaning of written and oral communication in English; to recognise and achieve the communication strategies.

Reflection: Students will be able to discuss advantages and disadvantages of learning a foreign language by means of technical support e.g. computers. They will use

- pripravo na mednarodne izpite Univerze Cambridge in pridobitev spričevala o aktivnem znanju angleškega jezika.

Uporaba:

S pridobljenim spričevalom o aktivnem znanju ang. jezika bo študent lahko izkazal znanje, ki ga je pridobil v programu, ki v celoti temelji na priporočenem evropskem jezikovnem okviru. Sam bo lahko svoje znanje ocenil s stopnjami od A1 do C2 glede na usvojeno znanje in pridobljeno oceno ob koncu programa, kar mu bo še v posebno pomoč pri izmenjavi študentov, v okviru evropskih programov: Erasmus, Leonardo, ipd.

Refleksija:

Študentje bodo glede na usvojeno znanje s področja tehnike (npr. računalništva) ugotavljali prednosti in slabosti uporabe le-teh pri učenju tujega jezika.

Prenosljive spretnosti - niso vezane le na en predmet:

Jasno in učinkovito ustno in pisno izražanje, samostojno učenje in iskanje informacij, kritično razmišljanje, timsko delo, organiziranje časa.

information technologies for searching information on www.

Transferable skills:

On completion of this course the student will be able to:

- use correctly the typical structures of general English and ESP;
- use the most appropriate strategies in language communication.

The language certificate based on Common European Language Framework (self-assessment) will enable students to take part in Erasmus, Leonardo and similar exchange programs.

Metode poučevanja in učenja:

- predavanja
- lektorske vaje
- delo v parih in skupinah
- problemsko zasnovano učenje jezika in analiza študijskih primerov
- A/V predstavitve

Learning and teaching methods:

- lectures
- practice
- pair work
- problem solving and case study
- A/V presentations

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, midterm exams, project work)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:**Pet najpomembnejših del:**

1. BOSTIČ, Nina. Model essay as a feedback tool in task 2 of the IELTS writing exam instruction for Slovene students. *ELOPE*, ISSN 1581-8918. [Tiskana izd.], Spring 2011, vol. 8, str. 91-105. [COBISS.SI-ID [49094242](#)]

2. BOSTIČ, Nina. The dispute between Jonathan Franzen and Oprah Winfrey. *Acta neophilologica*, ISSN 0567-784X, 2008, letn. 41, št. 1/2, str. 25-32. [COBISS.SI-ID [38079842](#)]

3 RUGELJ, Darja (urednik), BOSTIČ Nina, et al.. *Faculty of Health Sciences*. Ljubljana: Faculty of Health Sciences, 2011. 122 str., ilustr. ISBN 978-961-6808-22-4. [COBISS.SI-ID [254659584](#)]

4 LUCARIELLO, Joan M., JURIŠEVIČ, Mojca (urednik, prevajalec), BOSTIČ Nina, et al. *Dvajset najpomembnejših psiholoških načel za poučevanje in učenje od vrtca do srednje šole*. Ljubljana: Pedagoška fakulteta, Center za raziskovanje in spodbujanje nadarjenosti (CRSN), cop. 2016. 38 str. ISBN 978-961-253-195-9. <http://www.apa.org/ed/schools/cpse/top-twenty-principles.aspx>. [COBISS.SI-ID [286846976](#)]

5 PLEVNIK, Miha (glavni in odgovorni urednik), CEFERIN Mojca, BOSTIČ Nina, KRIŽ Andrej. *43. Krkine nagrade : znanost povezuje : zbornik povzetkov : 23. simpozij, Novo mesto, 18. oktober 2013*. Novo mesto: Krka, [2013]. 91 str., ilustr. [COBISS.SI-ID [27187239](#)]

Celotna bibliografija je dostopna na COBISSu:

<http://izumbib.izum.si/bibliografije/Y20170313105702-A142909539.html>

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Angleški jezik – nivo B

Course title: English, level B

Študijski program in stopnja

Študijska smer

Letnik

Semester

Study programme and level

Study field

Academic year

Semester

Visokošolski strokovni študijski program računalništva in informatike, 1. stopnja	ni smeri	2, 3	zimski
Professional study program Computer and Information Science, 1st cycle	none	2, 3	fall

Vrsta predmeta / Course type

izbirni predmet /elective course

Univerzitetna koda predmeta / University course code:

63746

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
30	/	15	/	/	/	3

Nosilec predmeta / Lecturer:

lekt. mag. Nina Bostič Bishop

Jeziki /

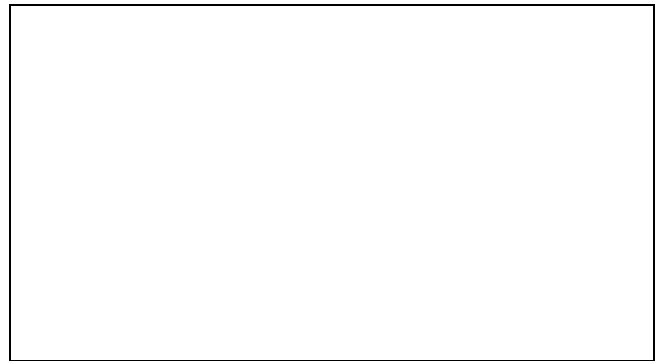
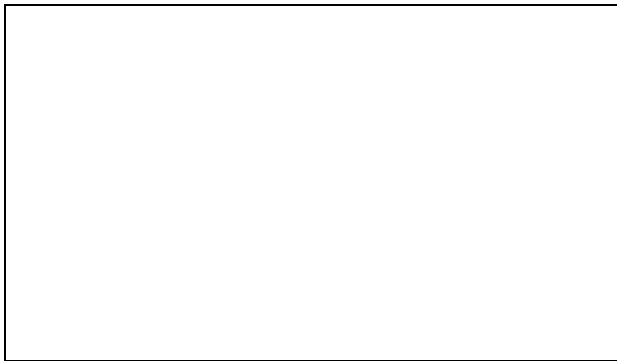
Languages:

Predavanja / Lectures: angleščina
English

Vaje / Tutorial: angleščina
English

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

Prerequisites:

**Vsebina:**

Pri predmetu obravnavamo različne teme s področja računalništva in tehničnih ved za doseganje:

- a) akademskih ciljev, ki se nanašajo na sposobnost branja tujejezičnih strokovnih besedil, znanstvenih revij in učbeniških gradiv;
- b) strokovnih ciljev, ki vključujejo sposobnost branja strokovnih besedil, ki se nanašajo na vsebino ostalih predmetov letnika, poročil, pisem; razumevanje govorov, pogajanj, dialogov, TV in radijskih programov; pisanje pogostih besedilnih vrst (povzetek, predstavitev, memorandum, elektronska pošta); primerno izražanje po telefonu, med pogajaji oz. sestanki in pri predstavitvah.
- c) principi tehnične komunikacije;
- d) priročnik + opisi programov (software/hardware);
- e) slovnične zakonitosti v tehniki;
- f) žargon – tehnična terminologija;
- g) tehnični teksti v luči različnih tipov angleščine.

Content (Syllabus outline):

Various topics from computer science field are studied in order to achieve :

- a) academic goals: students will be able to read professional texts, journals and textbooks
- b) professional goals which comprise the ability to read professional info, business reports , annual reports and letters, understand speeches, negotiations, conversations, TV programs; to write memoranda, professional emails; to communicate orally (in teleconferencing, negotiations, meetings, presentations
- c) principles of technical communication
- d) understanding manuals
- e) understanding grammar structures in technical texts
- f) understanding technical jargon
- g) technical texts in the light of different text types

Temeljni literatura in viri / Readings:

1. Harrison L., Cushen C. in Hutchison S. (2005). Achieve IELTS. Marshall Cavendish: London.
2. Wyatt R. (2001). IELTS Examination. Peter Collin Publishing: London.

Dodatna literatura:

3. Emmerson P. (2002). Business Grammar Builder. MacMillan: Oxford.
4. Davidson G. (2002). Learners' Companion Series Vocabulary. Learners Publishing: Singapore.
5. Brieger, N. In Pohl, A. (2002). Technical English Vocabulary and Grammar. Summertown: Summertown Publishing Limited
6. EVROTERM. Večjezična terminološka baza izrazov Evropske unije. Dostopno na: <http://www.sigov.si/evroterm>
7. Cambridge Dictionary Online. Dostopno na <http://dictionary.cambridge.org>

Cilji in kompetence:

Cilj predmeta je poglobiti splošno jezikovno znanje študentov ter jih seznaniti z jezikom stroke oz. osnovno strokovno terminologijo glede na študijsko smer. Pri predmetu se bodo študenti seznanili s spremembami in novostmi v angleškem jeziku, korespondence in pri predstavitev. Študenti bodo spoznali tudi strukturo fakultete (nazive laboratorijev, smeri, predmetnika) v tujem jeziku ter razvili bralno razumevanje strokovnih besedil in utrdili pripravo povzetkov vsebine v angleščini. Poleg tega bodo razvili tudi specifične poslovne komunikacijske veščine (telefoniranje, elektronska pošta, neformalni pogovori, predstavitev naloge oz. referata, predstavitev oddelka ali laboratorija, pisanje C.V.-ja in spremnega pisma, priprava na razgovor za delovno mesto).

Objectives and competences:

The aim of the subject is to enhance and expand the general knowledge of English and introduce terminology used in various fields of computer science.

Students will be informed about changes and new trends in language learning and changes in correspondence and presentations.

They will be able to describe the study and the structure of the Faculty, and develop critical attitude to different types of reading and writing.

They will develop specific strategies needed for business communication, non-formal and formal talks, presentations of their departments and they will be able to produce different types of CVs needed for respective situations.

Predvideni študijski rezultati:

Znanje in razumevanje:

Predmet bo študentom omogočil:

- utrditi in razširiti splošno in strokovno znanje angleškega jezika;
- samostojno učenje jezika in uporabo različnih virov (slovarji, učbeniki, časopisi in revije, spletne strani, ipd);
- pisanje povzetkov besedil;
- brati, analizirati in razumeti različna avtentična strokovna besedila;

Intended learning outcomes:

Knowledge and understanding:

Application:

Upon completion of this course the students will be able to:

-expand the general knowledge of the English language

- pripravo na mednarodne izpite Univerze Cambridge in pridobitev spričevala o aktivnem znanju angleškega jezika.

Uporaba:

S pridobljenim spričevalom o aktivnem znanju ang. jezika bo študent lahko izkazal znanje, ki ga je pridobil v programu, ki v celoti temelji na priporočenem evropskem jezikovnem okviru. Sam bo lahko svoje znanje ocenil s stopnjami od A1 do C2 glede na usvojeno znanje in pridobljeno oceno ob koncu programa, kar mu bo še v posebno pomoč pri izmenjavi študentov, v okviru evropskih programov: Erasmus, Leonardo, ipd.

Refleksija:

Študentje bodo glede na usvojeno znanje s področja tehnike (npr. računalništva) ugotavljali prednosti in slabosti uporabe teh pri učenju tujega jezika.

Prenosljive spretnosti - niso vezane le na en predmet:

Jasno in učinkovito ustno in pisno izražanje, samostojno učenje in iskanje informacij, kritično razmišljanje, timsko delo, organiziranje časa.

-work independently when studying the language by using various sources(dictionaries, web pages

-write summaries

-read, analyse and understand various authentic texts

-take one of internationally recognised tests, e.g. Cambridge University tests, TOEFL tests.

Which will enable them to assess their knowledge on the basis of Common European Language Framework (from A1 to C2); and will also give them to participate in international exchange programmes: Erasmus, Leonardo and similar.

Reflection:

The students will be able to differentiate between the weaknesses and threats of different electronic means in language learning

Transferable skills: communicate ideas effectively and clearly, develop critical thinking, team well and have a sense of time management.

Metode poučevanja in učenja:

- predavanja
- lektorske vaje
- delo v parih in skupinah
- problemsko zasnovano učenje jezika in analiza študijskih primerov
- A/V predstavitve

Learning and teaching methods:

- lectures
- practice
- pair work
- problem solving
- student case studies
- A/V presentations

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, midterm exams, project work)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail. (according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:**Pet najpomembnejših del:**

1. BOSTIČ, Nina. Model essay as a feedback tool in task 2 of the IELTS writing exam instruction for Slovene students. *ELOPE*, ISSN 1581-8918. [Tiskana izd.], Spring 2011, vol. 8, str. 91-105. [COBISS.SI-ID [49094242](#)]
2. BOSTIČ, Nina. The dispute between Jonathan Franzen and Oprah Winfrey. *Acta neophilologica*, ISSN 0567-784X, 2008, letn. 41, št. 1/2, str. 25-32. [COBISS.SI-ID [38079842](#)]
- 3 RUGELJ, Darja (urednik), BOSTIČ Nina, et al.. *Faculty of Health Sciences*. Ljubljana: Faculty of Health Sciences, 2011. 122 str., ilustr. ISBN 978-961-6808-22-4. [COBISS.SI-ID [254659584](#)]
- 4 LUCARIELLO, Joan M., JURIŠEVIČ, Mojca (urednik, prevajalec), BOSTIČ Nina, et al. *Dvajset najpomembnejših psiholoških načel za poučevanje in učenje od vrtca do srednje šole*. Ljubljana: Pedagoška fakulteta, Center za raziskovanje in spodbujanje nadarjenosti (CRSN), cop. 2016. 38 str. ISBN 978-961-253-195-9. <http://www.apa.org/ed/schools/cpse/top-twenty-principles.aspx>. [COBISS.SI-ID [286846976](#)]
- 5 PLEVNIK, Miha (glavni in odgovorni urednik), CEFERIN Mojca, BOSTIČ Nina, KRIŽ Andrej. *43. Krkine nagrade : znanost povezuje : zbornik povzetkov : 23. simpozij, Novo mesto, 18. oktober 2013*. Novo mesto: Krka, [2013]. 91 str., ilustr. [COBISS.SI-ID [27187239](#)]

Celotna bibliografija je dostopna na COBISSu:

<http://izumbib.izum.si/bibliografije/Y20170313105702-A142909539.html>

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Angleški jezik – nivo C

Course title: English, level C

Študijski program in stopnja

Študijska smer

Letnik

Semester

Study programme and level

Study field

Academic year

Semester

Visokošolski strokovni študijski program računalništva in informatike, 1. stopnja	ni smeri	2, 3	poletni
Professional study program Computer and Information Science, 1st cycle	none	2, 3	spring

Vrsta predmeta / Course type

izbirni predmet / elective course

Univerzitetna koda predmeta / University course code:

63747

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
30	/	15	/	/	/	3

Nosilec predmeta / Lecturer:

lekt. mag. Nina Bostič Bishop

Jeziki /

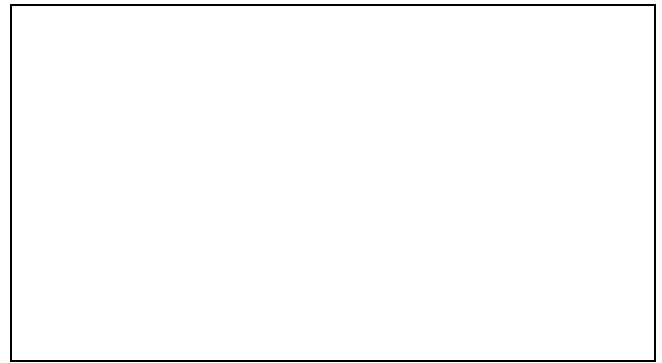
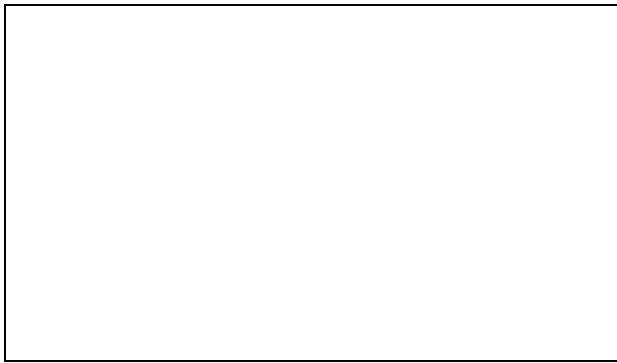
Languages:

Predavanja / Lectures: angleščina
English

Vaje / Tutorial: angleščina
English

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

Prerequisites:

**Vsebina:**

1. Slovnica – splošni pregled, ponovitev in utrjevanje skladno s stopnjo zahtevnosti posameznega izpita: pregled časov, modalni glagoli, frazni glagoli, glagolske strukture s prehodnimi in neprehodnimi glagoli, odvisni stavki, pogojni stavki, raba določnega in nedoločnega člena, predlogi, vezne besede.
2. Vsebinsko tematski sklopi iz literature, ki je predpisana za pripravo na posamezni izpit: Study at University, University departments, Dealing with problems, Working together (employment policy and applying for a job), Jobs and careers, Special projects, Meetings, Presentations, Applying for projects, Information and communication, Operations management. Sklopi pokrivajo splošne in specifične teme; odvisno od vrste in stopnje zahtevnosti izpita.
3. Predstavitev poteka in delov posameznih izpitov (govorjenje, poslušanje, pisanje, branje) ter nasveti, kako jih čim bolj učinkovito opraviti.

Content (Syllabus outline):

1. Grammar – general overview, revision and practice in accordance with the level of corresponding exam type: tenses, modal verbs, phrasal verbs, different verb structures with transitive and intransitive verbs, passive voice, conditional clauses, definite and indefinite article, prepositions and link words.
2. Various topics prescribed for the corresponding exam type: Study at University, University departments, Dealing with problems, Working together (employment policy and applying for a job), Jobs and careers, Special projects, Meetings, Presentations, Applying for projects, Information and communication, Operations management. Topics are of general and specific nature; depending on the type and level of exam.
3. Presentation covers four key skills (speaking, listening, writing and reading) with guidelines for effective presentations.

Temeljni literatura in viri / Readings:

1. Predpisana in potrjena literatura Univerze Cambridge za pripravo na izpit: Williams A. in Pile L. (2002) Pass Cambridge, BEC Vantage. Summertown Publishing: Oxford. in Williams A. in Pile L. (2002) Pass Cambridge, Bec Higher. Summertown Publishing: Oxford.
2. Emerson P. (2007). Business English Handbook Advanced. McMillan: Oxford.

Dodatna literatura:

3. Harrison L., Cushen C. in Hutchison S. (2005). Achieve IELTS. Marshall Cavendish: London.
4. Wyatt R. (2001). IELTS Examination. Peter Collin Publishing: London.
5. Anderson K. (2004). Study speaking. Cambridge University Press: Cambridge.
6. Cambridge Dictionary Online. Dostopno na <http://dictionary.cambridge.org>.

Cilji in kompetence:

Cilj predmeta je pripraviti študente na enega izmed mednarodno priznanih izpitov Univerze Cambridge iz splošne (npr. FCE, CAE, CPE, IELTS) oz. poslovne (BEC Preliminary, BEC Vantage in BEC Higher) angleščine.

Mednarodni izpiti iz splošne angleščine ocenjujejo jezikovno spretnost kandidatov, ki se odpravljajo na študij ali delo v angleško govoreče države.

Objectives and competences:

The aim of the course is to prepare students for one of the internationally recognised exams offered by the University Cambridge in general (e.g. FCE, CAE, CPE, IELTS) or business English (BEC Preliminary, BEC Vantage and BEC Higher).

The international exams in general English assess the foreign language skills of candidates who study or work in a foreign country.

Predvideni študijski rezultati:

Znanje in razumevanje:

Predmet bo študentom omogočil:

- pripravo na mednarodne izpite Univerze Cambridge in pridobitev spričevala o aktivnem znanju angleškega jezika.

Uporaba:

S pridobljenim spričevalom o aktivnem znanju ang. jezika bo študent lahko izkazal znanje, ki ga je pridobil v programu, ki v celoti temelji na priporočenem evropskem jezikovnem okviru. Sam bo lahko svoje znanje ocenil s stopnjami od A1 do C2 glede na usvojeno znanje in pridobljeno oceno ob koncu programa, kar mu bo še v posebno

Intended learning outcomes:

Knowledge and understanding:

The course will allow students:

- to prepare for international English exams offered by the University of Cambridge and help them acquire a formal language certificate.

Application:

With the acquired formal language certificate the students can demonstrate their English language knowledge acquired in the programme, which is entirely based on the recommended common European language framework.

They will be able of assessing their own knowledge with levels from A1 to C2

pomoč pri izmenjavi študentov ali pri delu v tujini.

Refleksija:

Študentje bodo glede na pridobljeno znanje zmožni opraviti enega izmed omenjenih izpitov.

Prenosljive spretnosti - niso vezane le na en predmet:

Jasno in učinkovito ustno in pisno izražanje ter povečanje samozavesti študentov pri komunikaciji v angleškem jeziku.

depending on the acquired knowledge and the awarded grade at the end of the course, which will be of special help during student exchange or while working abroad.

Reflection:

Students will be able to pass a specific exam according to the level of knowledge which they acquired.

Transferable skills:

Clear and effective oral and written communication and raising self-confidence when using English language.

Metode poučevanja in učenja:

- predavanja
- lektorske vaje
- delo v parih in skupinah
- problemsko zasnovano učenje jezika in analiza študijskih primerov
- A/V predstavitve

Learning and teaching methods:

- lectures
- tutorials
- pair and group work
- problem solving
- case studies
- A/V presentations

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

Sprotno preverjanje (domače naloge, kolokviji in projektno delo)

Končno preverjanje (pisni in ustni izpit)

Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).

50%

50%

Type (examination, oral, coursework, project):

Continuing (homework, midterm exams, project work)

Final (written and oral exam)

Grading: 6-10 pass, 5 fail.

(according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

BOSTIČ, Nina. Model essay as a feedback tool in task 2 of the IELTS writing exam instruction for Slovene students. *ELOPE*, ISSN 1581-8918. [Tiskana izd.], Spring 2011, vol. 8, str. 91-105. [COBISS.SI-ID [49094242](#)]

2. BOSTIČ, Nina. The dispute between Jonathan Franzen and Oprah Winfrey. *Acta neophilologica*, ISSN 0567-784X, 2008, letn. 41, št. 1/2, str. 25-32. [COBISS.SI-ID [38079842](#)]

3 RUGELJ, Darja (urednik), BOSTIČ Nina, et al.. *Faculty of Health Sciences*. Ljubljana: Faculty of Health Sciences, 2011. 122 str., ilustr. ISBN 978-961-6808-22-4. [COBISS.SI-ID [254659584](#)]

4 LUCARIELLO, Joan M., JURIŠEVIČ, Mojca (urednik, prevajalec), BOSTIČ Nina, et al. *Dvajset najpomembnejših psiholoških načel za poučevanje in učenje od vrtca do srednje šole*. Ljubljana: Pedagoška fakulteta, Center za raziskovanje in spodbujanje nadarjenosti (CRSN), cop. 2016. 38 str. ISBN 978-961-253-195-9. <http://www.apa.org/ed/schools/cpse/top-twenty-principles.aspx>. [COBISS.SI-ID [286846976](#)]

5 PLEVNIK, Miha (glavni in odgovorni urednik), CEFERIN Mojca, BOSTIČ Nina, KRIŽ Andrej. *43. Krkine nagrade : znanost povezuje : zbornik povzetkov : 23. simpozij, Novo mesto, 18. oktober 2013*. Novo mesto: Krka, [2013]. 91 str., ilustr. [COBISS.SI-ID [27187239](#)]

Celotna bibliografija je dostopna na COBISSu:

<http://izumbib.izum.si/bibliografije/Y20170313105702-A142909539.html>

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Produkcija multimedijskih gradiv
Course title:	Multimedia Content Production

Študijski program in stopnja	Študijska smer	Letnik	Semester
Study programme and level	Study field	Academic year	Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	poletni
Professional study program Computer and Information Science, 1st cycle	none	2	spring

Vrsta predmeta / Course type izbirni predmet /elective course

Univerzitetna koda predmeta / University course code: 63726

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samost. delo	ECTS
Lectures	Seminar	Tutorial	Laboratory work	Field work	Individ. work	
45	10	20	/	/	105	6

Nosilec predmeta / Lecturer: viš. pred. dr. Borut Batagelj

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

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

Vpis naslednjega predmeta iz predhodnega semestra:

- Grafično oblikovanje

The following subject from previous semesters:

- Graphic Design

Vsebina:

Vsebina predmeta:

1. Teoretičen in zgodovinski pregled multimedije in novih medijev
2. Načrtovanje produkcije multimedijskih gradiv
 - Komunikološki vidiki
 - Pravni vidiki
3. Producerski cikel multimedijskih gradiv
 - Zajem, shranjevanje, priklic, obdelava, upravljanje, distribucija, arhiviranje
4. Formati za predstavitev slik, videa in zvoka
5. Distribucijski formati
6. Zvok
 - Digitalizacija zvoka
 - Urejanje zvoka
7. Produkcija digitalnega videa
 - Priprave na snemanje, snemanje, montaža, post-produkcija
8. Animacija
9. Produkcija hipermedijskih nosilcev
10. Produkcija in oblikovanje spletnih hipermedijskih predstavitev
11. Napredne interaktivne multimedijske predstavitve

Predmet bo usmerjen k spoznavanju tehnologij, orodij in postopkov za produkcijo multimedijskih gradiv. Predmet bo zelo praktično usmerjen, študentje bodo osvojili teoretične prijeme ter jih preizkusili na praktičnih primerih. Vaje bodo temu prilagojene, izvajale pa se bodo v računalniški učilnici opremljeni z ustrezno strojno in programsko opremo.

Content (Syllabus outline):

During the course the following topics will be presented:

1. Theoretical and historical overview of multimedia
2. Planning the multimedia content production
 - Communicological aspects
 - Legal aspects
3. Production cycle in multimedia
 - Capturing, storing, searching, processing, management, delivering, archiving
4. Image, video, and sound formats
5. Delivery formats
6. Audio
 - Digitalization of sound
 - Audio editing
7. Production of digital video
 - Preparations, recording, editing, post-production
8. Animation
9. Delivering multimedia
10. Production and design of hypermedia presentations on the web
11. Advanced interactive multimedia presentations

The course will familiarize the students with the key technologies, procedures, and tools for production of multimedia content. The course is very practically oriented; the students will learn the theoretical principles and apply them in practice by working on multimedia projects. The practice classes will facilitate such kinds of hands-on work; they will take place in a classroom with suitable software and hardware equipment.

Temeljni literatura in viri / Readings:

- Nigel Chapman, Jenny Chapman, Digital Multimedia, 3rd Edition, Wiley, 2009.
- Tay Vaughan, Multimedia: Making it Work, Eight Edition, McGraw-Hill Osborne Media, 2011.

Cilji in kompetence:

Cilj predmeta je študente spoznati z različnimi vidiki produkcije multimedijjskih vsebin. Poudarek je na spoznavanju celotnega cikla produkcije, na kreativnem obvladovanju tehnologij in orodij za zajem, obdelavo, hranjenje in distribucijo vsebin, ter na razumevanju specifičnih izraznih in komunikacijskih možnosti v novih medijih.

Objectives and competences:

The course aims at familiarizing the students with different aspects of multimedia content production. The emphasis is on learning about the entire production cycle, on creative work with modern technologies and tools for recording, editing and delivering of multimedia, as well as understanding of specific expressive and communication possibilities in new media.

Predvideni študijski rezultati:

Znanje in razumevanje: Poznavanje postopkov, tehnologij in orodij za produkcijo multimedijjskih gradiv.

Uporaba: Uporaba tehnologij in orodij za delo z multimedijjskih vsebinami. Sposobnost produkcije multimedijjskih gradiv.

Refleksija: Razumevanje primernosti teoretičnih principov pri produkciji multimedijjskih gradiv in njihov prenos v prakso. Razumevanje specifičnih izraznih in komunikacijskih možnosti ki jih nudijo novi mediji.

Prenosljive spretnosti - niso vezane le na en predmet:

Uporaba pridobljenih znanj pri sorodnih predmetih, multidisciplinaren pristop, uporaba primerne programske in strojne opreme.

Intended learning outcomes:

Knowledge and understanding: Knowledge on procedures, technologies, and tools for multimedia content production.

Application: The application of technologies and tools for multimedia content production.

Reflection: Understanding the suitability of the theoretical principles of multimedia content production and their application in practice. Understanding of specific expressive and communication means offered by new media.

Transferable skills: Application of the acquired knowledge during related courses, multidisciplinary approach, the use of the appropriate software and hardware.

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

Predavanja s podporo ustrezne avdio-vizualne opreme strojne in programske opreme, laboratorijske vaje v ustrezno opremljeni računalniški učilnici. Delo posamezno in v skupinah. Veliko poudarka na praktični delu v celotnem ciklu produkcije multimedijjskih gradiv.

Lectures with the appropriate audio-visual equipment in a classroom with suitable hardware and software. Individual and group work. Emphasis on hands-on approaches and practical project work.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Sprotno preverjanje (praktične naloge)	25%	practical assignments
Končno preverjanje (pisni izpit)	25%	examination
Projektna naloga	50%	project work
Vsak del mora biti pozitiven (>=50%) Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).		Each part must be positive (>=50%) Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:**Pet najpomembnejših del:**

PAVLIN, Erika, ELSNER, Žiga, JAGODNIK, Tadej, BATAGELJ, Borut, SOLINA, Franc. From illustrations to an interactive art installation. Journal of information, communication & ethics in society, ISSN 1477-996X. [Print ed.], 2015, vol. 13, no. 2, str. 130-145, ilustr.
<http://www.emeraldinsight.com/doi/full/10.1108/JICES-02-2014-0007>, doi: 10.1108/JICES-02-2014-0007.

SOLINA, Franc, MAJCEN, Gregor, BOVCON, Narvika, BATAGELJ, Borut. Preservation of a computer-based art installation. V: IOANNIDES, Marinos (ur.), et al. Digital heritage : progress in cultural heritage: documentation, preservation, and protection : 5th International Conference, EuroMed 2014, Limassol, Cyprus, November 3-8, 2014 : proceedings, (Lecture notes in computer science (Internet), ISSN 1611-3349, 8740). Heidelberg [etc.]: Springer, cop. 2014, str. 643-650, ilustr.
http://link.springer.com/chapter/10.1007/978-3-319-13695-0_65.

PEER, Peter, BATAGELJ, Borut. Art - a perfect testbed for computer vision related research. V: GRGIĆ, Mislav (ur.), DELAČ, Krešimir (ur.), GHANBARI, Mohammed (ur.). *Recent advances in multimedia signal processing and communications*, (Studies in computational intelligence, vol. 231). Berlin; Heidelberg: Springer, cop. 2009, str. 611-629.

RAVNIK, Robert, BATAGELJ, Borut, KVERH, Bojan, SOLINA, Franc. Dynamic anamorphosis as a special, computer-generated user interface. *Interact. comput.*, 2013, str. 1-17.

KVERH, Bojan, LIPANJE, Matevž, BATAGELJ, Borut, SOLINA, Franc. Piano crossing - walking on a keyboard. *Acta graph.*, 2010, vol. 22, no. 3/4, str. 25-38.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Grafično oblikovanje

Course title: Graphic Design

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika Interdisciplinarni univerzitetni študijski program prve stopnje Upravna informatika	ni smeri	2	zimski
Professional study program Computer and Information Science, 1st cycle Interdisciplinary university Study Programme in Administrative Informatics 1 st Cycle	none	2	fall

Vrsta predmeta / Course type

RI: izbirni predmet / CIS: elective course
UI: obvezni predmet / AI: compulsory course

Univerzitetna koda predmeta / University course code:

63715

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer:

izr. prof. dr. Narvika Bovcon, izr. prof. dr. Iztok Lebar Bajec

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

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

Prerequisites:

Vsebina:

- Zgodovina in razvoj oblikovanja
- Principi grafičnega oblikovanja
- Grafični elementi, lastnosti in organizacija
- Teorija barv in barvne lestvice
- Tipografije in njihova uporaba kot izrazno sredstvo
- Osnovni pojmi in cilji vizualizacije podatkov in informacij
- Teorija zaznavanja in osnovni koncepti vizualizacije podatkov in informacij
- Napredni pristopi vizualizacije podatkov in informacij
- Vizualizacija podatkov in informacij za potrebe poročanja in javnega nastopanja
- Načrtovanje spletišča
- Načrtovanje uporabniškega vmesnika

Content (Syllabus outline):

- The history and development of design
- The principles of graphic design
- Graphic elements, properties and organisation
- Colour theory and colour pallets
- Typography and its use as a means of expression
- Principles and goals of data and information visualization
- Perception theory and basic approaches to data and information visualization
- Intermediate data and information visualization techniques
- Data and information visualisation for presentations and public speaking
- Design of a web site
- Designing a user interface

Temeljni literatura in viri / Readings:

- Data Flow: Visualising Information in Graphic Design. Berlin: Gestalten, 2008.
- Flusser, V. Digitalni videz. Ljubljana: Študentska založba, 2000.
- Manovich, L. The Language of New Media. MIT, 2001.
- Samara, T. Design Elements: A Graphic Style Manual. Rockport Publishers, 2007.
- Strehovec, J. Besedilo in novi mediji. Ljubljana: LUD Literatura, 2007.
- Tufte, R. E. The Visual Display of Quantitative Information. Graphics Press LLC, 2001.
- Virtualni učitelji in priročniki za programe Adobe: Illustrator, Photoshop, Flash.

Cilji in kompetence:

Cilj predmeta je študentom predstaviti osnove vizualnega jezika in postopke grafičnega oblikovanja. Oblikovalsko znanje bodo študenti uporabili pri oblikovanju računalniških vmesnikov, elektronskih dokumentov, spletnih strani ter pri vizualizaciji podatkov.

Študenti bodo razvijali sledeče kompetence:

- Sposobnost strokovne komunikacije tako v materinem jeziku, kot tudi tujem.
- Sposobnost timskega dela v strokovnem okolju; upravljanje majhne skupine strokovnjakov.
- Sposobnost prenosa znanja sodelavcem v tehnoloških in raziskovalnih skupinah.

Objectives and competences:

The objective is to introduce the students of computer science and informatics to the basics of visual language and common approaches to graphic design. The students will apply the acquired knowledge to the design of user interfaces, electronic documents, web sites and information visualization.

The students will be developing the following competences:

- The ability of professional communication in the native language as well as a foreign language.
- The ability of teamwork within the professional environment; management of a small professional team.
- The ability to transmit knowledge to co-workers in technology and research groups.

Predvideni študijski rezultati:

Znanje in razumevanje:

Poznavanje zakonitosti likovnega izražanja, od osnovnih likovnih prvin do principov gradnje podobe. Poznavanje zakonitosti uporabe črkovnih vrst. Poznavanje zakonitosti uporabe barv in barvnega kodiranja v računalniških okoljih. Razumevanje načinov strukturiranja informacij v vizualnih komunikacijah.

Uporaba:

Uporaba oblikovalskih metod in uporabniških oblikovalskih programov za oblikovanje spletnih strani, elektronskih dokumentov, računalniških vmesnikov, vizualizacij podatkov.

Refleksija:

Intended learning outcomes:

Knowledge and understanding:

Knowledge of the fundamentals of visual communication, from visual elements to principles of form. Knowledge of the fundamentals of using typography. Knowledge of the application of colour and colour coding in computer environments. Knowledge of approaches to structuring information in visual communication.

Application:

Application of graphic design and use of professional software for the design of user interfaces, electronic documents, web sites and information visualisation.

Reflection:

Kritično vrednotenje in razumevanje oblikovalskih postopkov pri praktični uporabi.

Prenosljive spretnosti - niso vezane le na en predmet:

Sposobnost reševanja problemov pri načrtovanju ustrezne vizualne komunikacije. Sposobnost uporabe domače in tuje literature ter nadgrajevanja znanja in integracije novih postopkov, podatkov, pristopov k pridobljenemu znanju. Sposobnost kritičnega razmišljanja in pisanja strokovnih člankov.

Critical assessment and understanding of design approaches in practical use.

Transferable skills:

Competence in designing suitable visual communications. Competence in using domestic and foreign relevant literature for extending the acquired knowledge. Competence in critical thinking.

Metode poučevanja in učenja:

Predavanja, vaje v šoli, seminarji zajemajo domače delo. Poseben poudarek je na sprotne študiju. Poseben vidik je vpeljevanje v skupinsko delo.

Learning and teaching methods:

Lectures, lab work, project work and homework. Special attention is given to continuous study and group work.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):		Type (examination, oral, coursework, project):
Sprotno preverjanje (domače naloge, kolokviji in projektno delo)	50%	Continuing (homework, midterm exams, project work)
Končno preverjanje (pisni in ustni izpit)	50%	Final (written and oral exam)
Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).		Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

Celotna bibliografija doc. dr. Bovconove je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=33966>.

Celotna bibliografija doc. dr. Lebarja Bajca je dostopna na SICRISu:
<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=13327>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Algoritmi in podatkovne strukture 2
Course title:	Algorithms and Data Structures 2

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	poletni
Professional study program Computer and Information Science, 1st cycle	none	2	spring

Vrsta predmeta / Course type obvezni predmet / compulsory course

Univerzitetna koda predmeta / University course code: 63723

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer: doc. dr. Andrej Brodnik

Jeziki / Languages:	Predavanja / Lectures:	slovenščina / angleščina Slovene / English
	Vaje / Tutorial:	slovenščina / angleščina Slovene / English

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

Diskretne strukture. Analiza I. Osnovno znanje programiranja, Algoritmi in podatkovne strukture 1.

Prerequisites:

Discrete structures. Calculus I. Basic knowledge of programming, Algorithms and Data Structures 1.

Vsebina:

Pri predmetu *Algoritmi in podatkovne strukture 2* študent spozna osnovna orodja za analizo kakovosti rešitve in problema.

1. Osnovno matematično orodje
 - ocenjevalne funkcije O , Ω , Θ in razlike med njimi;
 - kaj je zahtevnost problema in kaj zahtevnost rešitve;
 - verjetnost in naključnost;
 - računski modeli;
 - osnovne analize podatkovnih struktur in algoritmov.
2. Številna drevesa (*trie*)
 - osnovna izvedba,
 - stiskanje po poti in po plasteh.
3. Disjunktne množice in amortizacija.
4. Slovar
 - deterministične rešitve,
 - naključnostne rešitve.
5. Vrsta s prednostjo
 - osnovna abstraktna podatkovna struktura (kopica),
 - razširjena abstraktna podatkovna struktura (binomska in Fibonaccijeva kopica, vEB).
6. Urejanje
 - zahtevnost problema,
 - metoda pregledovanja,
 - metoda deli in vladaj,
 - metoda uporabe obstoječih podatkovnih struktur,
 - urejanje v linearnem času,
 - urejanje na vzporednih strojih.
7. Rang in izbira
 - dinamična podatkovna struktura (razširjanja drevesa),
 - statična podatkovna struktura (mediana).
8. Metoda dinamičnega programiranja.
9. Algoritmi na grafih in omrežjih
 - topološko urejanje,
 - metoda požrešnosti: najcenejša vpeta drevesa,
 - metoda sproščanja: najkrajše poti v grafih,
 - pretoki v omrežjih,
 - vzporedni algoritmi v omrežjih s pogledom na medmrežje.

Content (Syllabus outline):

In course *Algorithms and Data Structures 2* student learns about the basic tools for the analysis of algorithms complexity and problem complexity.

1. Basic mathematical tools
 - order functions O , Ω , Θ and differences between them;
 - what is the complexity of a problem and what is the complexity of a solution;
 - probability and randomization;
 - models of computation;
 - basic analysis of data structures and algorithms.
2. Radix trees (*trie*)
 - basic implementation,
 - path and level compression.
3. Disjoint sets and amortization.
4. Dictionary
 - deterministic solutions,
 - probabilistic solutions.
5. Priority queue
 - basic abstract data structure (heap),
 - extended abstract data structure (binomial and Fibonacci heap, vEB).
6. Sorting
 - problem complexity,
 - method of exhaustive search,
 - method of divide and conquer,
 - method of use of existing data structures,
 - sorting in linear time,
 - sorting in parallel.
7. Rank and select
 - dynamic data structure (extended trees),
 - static data structure (median).
8. Method of dynamic programming.
9. Algorithms of graphs and networks
 - topological sorting,
 - greedy method: minimum spanning tree,
 - relaxation method: shortest paths,
 - maximum network flow,
 - parallel algorithms and Internet.
10. Selected algorithms
 - optimization problems: use of Bloom's filter, method branch and bound;
 - mathematical algorithms and cryptography: matrix multiplication,

10. Izbrani algoritmi

- optimizacijski algoritmi: metoda Bloomovega filtra, metoda razveji in omeji.
- matematični algoritmi s pogledom na kriptografijo: množenje matrik, reševanje sistema enačb, FFT, iskanje največjega skupnega delitelja, modularna aritmetika, eksponenti;
- algoritmi na nizih s pogledom na bioinformatiko: iskanje podniza.

Pri vseh problemih si bomo pogledali tudi nekaj osnovnih vzporednih rešitev.

solving system of equations, FFT, maximum common divisor, modular arithmetic, exponents;

- algorithms on strings and bioinformatics: pattern search.

With all problems we will also take a brief look at parallel solutions.

Temeljni literatura in viri / Readings:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest in Clifford Stein, Introduction to Algorithms. McGraw-Hill.
2. Robert Sedgewick, Algorithms in Java. Addison-Wesley.
3. Jernej Kozak, Podatkovne strukture in algoritmi. DMFA, 1986.
4. Igor Kononenko, Načrtovanje podatkovnih struktur in algoritmov. Založba FE in FRI, 1996, Ljubljana.

Cilji in kompetence:

Študent se spozna z osnovnimi metodami analize in snovanja podatkovnih struktur in algoritmov ter vrednotenjem njihove kakovosti.

Splošne kompetence: abstraktno in analitično mišljenje, zmožnost definiranja in formalizacije problema, študij literature in priprava seminarskega dela. Predmetno specifične kompetence: modularizacija, enkapsulacija in abstrakcija; osnove inženirskega znanja v obliki združevanja obstoječih rešitev, tvorjenje modela za reševanje problemov, vrednotenje kakovosti dane rešitve, razlikovanje med problemom in rešitvijo (eno od), uporabljati algoritmični pristop – za reševanje danega problema razviti algoritem.

Objectives and competences:

Student gets familiar with basic methods for analysis and design of data structures and algorithms, and learns how to evaluate their quality.

General competencies: abstract and analytical thinking, capability to define and formalize the problem, literature study and approach to a seminar work. Specific competencies: modularization, encapsulation and abstraction; basics of engineering knowledge in a sense of integration of existing solutions, evaluation of quality of a solution, differentiation between the problem and solution (one of), knowledge of applying an algorithmic approach – how to develop an algorithm to solve a problem.

Predvideni študijski rezultati:

Študent pozna osnovne pojme iz snovanja podatkovnih struktur in algoritmov.

Intended learning outcomes:

Student learns basic terms in data structures and algorithms design.

Zna razčlenjevati probleme in rešitve nato združevati v skupno rešitev ter ovrednotiti njihovo kakovost.

(S)he learns how to analyze problems and then combine solutions into a general solution, and evaluate their quality.

Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja, vaje, domače naloge, seminarji, konzultacije, laboratorijsko delo.

Lectures, exercises, assignments, seminars, consultations, laboratory work.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

6 domačih nalog: povprečje vsaj 40%, vsak naloga vsaj 20%, vsako programersko vprašanje vsaj 20%	40%	6 assignments: average at least 40% each assignment at least 20% each programming question at least 20%
dva kolokvija: vsak vsaj 40% in povprečje vsaj 50%; ali pisni izpit: vsaj 50%,	60%	two midterms: each at least 40% and average at least 50%; or final exam: at least 50%
Zapiski s predavanj ali vaj.		Notes from lectures and exercises.
Ustni izpit po potrebi.		Oral exam if needed.
Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).		Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

ĐORĐEVIĆ, Milan, GRGUROVIČ, Marko, BRODNIK, Andrej. Performance analysis of the partial use of a local optimization operator on the genetic algorithm for the Travelling Salesman Problem. *Business systems*

research journal, 2012, vol. 3, no. 1, str. 14-22, doi: [10.2478/v10305-012-0002-4](https://doi.org/10.2478/v10305-012-0002-4). [COBISS.SI-ID [1024466004](#)]

BERGLUND, Tomas, BRODNIK, Andrej, JONSSON, Håkan, STAFFANSON, Mats, SÖDERKVIST, Inge. Planning smooth and obstacle-avoiding B-spline paths for autonomous mining vehicles. *IEEE trans. autom. sci. eng.*. [Print ed.], Jan. 2010, vol. 7, no. 1, str. 167-172, ilustr. [COBISS.SI-ID [7730260](#)]

ZADRAVEC, Mirko, BRODNIK, Andrej, MANNILA, Markus, WANNE, Merja, ŽALIK, Borut. A practical approach to the 2D incremental nearest-point problem suitable for different point distributions. *Pattern recogn.*. [Print ed.], feb. 2008, vol. 41, iss. 2, str. 646-653. <http://dx.doi.org/10.1016/j.patcog.2007.06.031>, doi: [10.1016/j.patcog.2007.06.031](https://doi.org/10.1016/j.patcog.2007.06.031). [COBISS.SI-ID [11580182](#)]

BRODNIK, Andrej, CARLSSON, Svante, FREDMAN, Michael L., KARLSSON, Johan, MUNRO, J. Ian. Worst case constant time priority queue. *J. syst. softw.*. [Print ed.], 2005, vol. 78, no. 3, str. 249-256. <http://www.sciencedirect.com/science/journal/01641212>. [COBISS.SI-ID [13758553](#)]

BRODNIK, Andrej, IACONO, John. Unit-time predecessor queries on massive data sets. *Lect. notes comput. sci.*, part 1, str. 133-144, ilustr. [COBISS.SI-ID [8178260](#)]

Celotna bibliografija dr. Brodnika je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=5281>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Komunikacijski protokoli in omrežna varnost
Course title: Communications Protocols and Network Security

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	zimski
Professional study program Computer and Information Science, 1st cycle	none	2	fall

Vrsta predmeta / Course type

izbirni predmet /elective course

Univerzitetna koda predmeta / University course code:

63716

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer:

doc. dr. Andrej Brodnik

Jeziki /

Predavanja / Lectures:

slovenščina, angleščina
Slovene, English

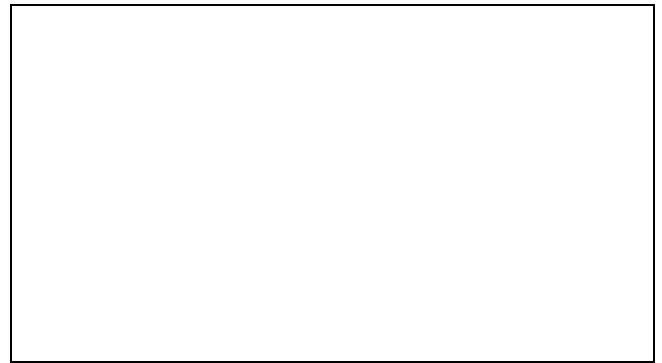
Languages:

Vaje / Tutorial:

slovenščina, angleščina
Slovene, English

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

Prerequisites:

**Vsebina:**

11.	Uvod in ponovitev osnov TCP/IP tehnologije
12.	Protokoli omrežne plasti <ul style="list-style-type: none">- MPLS, mobilni IP- razpošiljanje (<i>multicasting</i>)
13.	Protokoli aplikacijske plasti <ul style="list-style-type: none">- zagonski protokoli (DHCP, BOOTP)- e-poštni protokoli (SMTP, IMAP, POP, MIME)- multimedijski protokoli (RTP, RSVP, QoS)- protokoli za upravljanje omrežij (SNMP)
14.	Splošni uvod o omrežni varnosti <ul style="list-style-type: none">- uvod v kriptografijo, javni in zasebni ključi,- simetrična in asimetrična kriptografija, izvlečki- načini delovanja (npr.) CBC, triple DES, OFB, CFB, CTR, ter njihove izvedbe
15.	Avtentikacija, gesla in njihova zasebnost, avtentikacijski protokoli in napadi nanje
16.	Razdeljevanje ključev s shemo skritih ključev, Kerberos <ul style="list-style-type: none">- podrobnosti Kerberos sistema in analiza
17.	Razdeljevanje javnih ključev in PKI <ul style="list-style-type: none">- analiza PKI modelov
18.	Pregled in analiza različnih standardov, <ul style="list-style-type: none">- npr. SSL, IPsec- podrobnosti nekaterih kriptografskih algoritmov (npr. Diffie-Hellman, RSA)
19.	E-pošta in načini napada nanjo ter načini varovanja

Content (Syllabus outline):

1.	Introduction and basics of TCP/IP
2.	Protocols of a network layer <ul style="list-style-type: none">- MPLS, mobile IP- multicasting
3.	Protocols of an application layer <ul style="list-style-type: none">- Boot-strap protocols (DHCP, BOOTP)- E-mail protocols (SMTP, IMAP, POP, MIME)- Multimedia protocols (RTP, RSVP, QoS)- Network management protocols (SNMP)
4.	General introduction in network security <ul style="list-style-type: none">- Introduction into cryptography, public and private keys,- Symmetric and asymmetric cryptography, digests- Modes of operation, e.g. CBC, triple DES, OFB, CFB, CTR, and their derivatives
5.	Authentication, passwords and their privacy, authentication protocols and attacks on them
6.	Secret key distribution, Kerberos <ul style="list-style-type: none">- Details of Kerberos and analysis
7.	Public key distribution and PKI <ul style="list-style-type: none">- Analysis of PKI models
8.	Survey and analysis of various standards <ul style="list-style-type: none">- E.g. SSL, IPsec- Some details of cryptographic algorithms (e.g. Diffie-Hellman, RSA)
9.	E-mail, attacks on it and its protection

Temeljni literatura in viri / Readings:

1. RFC standards.
2. Douglas E. Comer, Internetworking with TCP/IP, vol.1. Prentice Hall.
3. M. Subramanian: Network Management: An introduction to principles and practice, Addison Wesley Longman.
4. A. Farrel, The Internet and Its Protocols: A Comparative Approach, Morgan Kaufmann.
5. E. Cole, Network Security Bible, Wiley.
6. C. Kaufman, R. Perlman, M. Speciner, Network Security: Private Communication in a Public World, Prentice Hall.
7. Andrew S. Tanenbaum, Computer Networks. Prentice Hall.
8. J. F. Kurose, K. W. Ross: Computer Networking, Addison-Wesley.
9. Adrian Farrel: The Internet and Its Protocols: A Comparative Approach, Morgan Kaufmann.

Cilji in kompetence:

Študent so se že spoznali z osnovnimi koncepti računalniških komunikacij in omrežij ter operacijskih sistemov. Pri tem predmetu se bomo podrobneje seznanili z nekaterimi pomembnejšimi protokoli in se v drugem delu predmeta spoznali z osnovami varovanja računalniških in (širše gledano) informacijskih sistemov.

Cilj predmeta je predvsem v pridobitvi praktičnih znanj. Teoretična znanja so podana le v nujnem obsegu.

Objectives and competences:

Students already learnt about basic concepts of computer communications and operating systems. In this course they will we will learn more details about some more important protocols and in the second half get more familiar with basic methods and techniques for protecting of computer and general information systems.

The goal of the project is to acquire practical knowledge. The theoretical background is presented only in the necessary amount.

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent pozna delovanje konkretnih primerov protokolov ter posplošuje znanje na druge protokole. Pozna osnovne probleme sistemske in omrežne varnosti ter načinov varovanja le-teh.

Uporaba:

Sposoben je upravljanja in uporabe konkretnih protokolov in vzdrževanja osnovne varnosti v sistemu.

Refleksija:

Spoznavanje in razumevanje pretvorbe praktičnega problema v prepoznavni inženirski vzorec.

Prenosljive spretnosti - niso vezane le na en

predmet:

Teoretične osnove za inženirsko reševanje različnih praktičnih problemov, ki se pojavljajo v sistemskih problemih.

Intended learning outcomes:

Knowledge and understanding:

Student understands how particular protocols operate and is capable to generalize to other protocols. (S)he is familiar with basic problems of system and network security and the methods of its protection.

Application:

Student is capable to manage and use particular protocols, and to maintain basic security in the system.

Reflection:

Capable to recognize and understand the conversion of a practical problem into an engineering pattern.

Transferable skills:

Theoretical basic skills for the engineering approach in solving of practical problems appearing in systems.

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Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja, vaje, domače naloge, seminarji, konzultacije, laboratorijsko delo.

Lectures, exercises, assignments (homeworks), seminars, consultations, laboratory work.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).		Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).
<ul style="list-style-type: none"> dva kolokvija: vsak vsaj 40% in povprečje vsaj 50%; ali končni izpit: vsaj 50% 	40%	<ul style="list-style-type: none"> two midterms: each at least 40% and average at least 50%; or final exam: at least 50%
<ul style="list-style-type: none"> dve seminarski / laboratorijski nalogi: vsaka vsaj 20% in povprečje vsaj 40% 	40%	<ul style="list-style-type: none"> two seminar / laboratory works: each at least 20% and average at least 40%
<ul style="list-style-type: none"> štiri domače naloge: vsaka naloga vsaj 20% in povprečje vsaj 40% 	20%	<ul style="list-style-type: none"> four assignments: each assignment at least 20% and average at least 40%
<ul style="list-style-type: none"> zapiski s predavanj ali vaj 		<ul style="list-style-type: none"> notes from lectures or exercises

Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

- DEGERMARK, Mikael, BRODNIK, Andrej, CARLSSON, Svante, PINK, Stephen. Small forwarding tables for fast routing lookups. V: Applications, technologies, architectures, and protocols for computer communication: ACM SIGCOMM '97, Conference, Palais des Festivals, Cannes, France, 14 to 18 September 1997, (Computer communication review, Let. 27, št. 4). New York: ACM Press, cop. 1997, str. 3-14. [COBISS.SI-ID 7480921]
- KARLSSON, Johan, BODIN, Ulf, BRODNIK, Andrej, NILSSON, Andreas, SCHELÉN, Olov. Extended expedited forwarding: the in-time PHB group. V: Eighth IEEE International Symposium on Computers

and Communication: (ISCC 2003): proceedings: Kemer-Antalya, Turkey, June 30-July 3, 2003. Los Alamitos, Calif.: IEEE Computer Society Press, 2003, str. 291-297. [COBISS.SI-ID 1567703]

3. ALJAŽ, Tomaž, BRODNIK, Andrej. Supplementary services in telecommunication next generation networks. V: 2004 IEEE/IFIP Network Operations and Management Symposium Application sessions, April 19-23, 2004, Seul, Korea. NOMS 2004, (30 cm). Piscataway: IEEE, 2004, str. 159-172. [COBISS.SI-ID 8752918]

4. CIGLARIČ, Mojca, KREVL, Andrej, JELIČIČ, Milan, BRODNIK, Andrej. Laboratory as a service: architecture, implementation and experiences. Asia-Pac. collab. educ. journal. [Print ed.], 2010, vol. 6, no. 2, str. 69-86, ilustr. [COBISS.SI-ID 8183892]

5. BRODNIK, Andrej, IACONO, John. Unit-time predecessor queries on massive data sets. Lect. notes comput. sci., part 1, str. 133-144, ilustr. [COBISS.SI-ID 8178260]

Celotna bibliografija dr. Brodnika je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=5281>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Vgrajeni sistemi
Course title:	Embedded Systems

Študijski program in stopnja	Študijska smer	Letnik	Semester
Study programme and level	Study field	Academic year	Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	3	zimski
Professional study program Computer and Information Science, 1st cycle	none	3	fall

Vrsta predmeta / Course type izbirni predmet /elective course

Univerzitetna koda predmeta / University course code: 63738

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samost. delo	ECTS
Lectures	Seminar	Tutorial	Laboratory work	Field work	Individ. work	
45	10	20	/	/	105	6

Nosilec predmeta / Lecturer: izr. prof. dr. Patricio Bulić

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

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

Vpis naslednjih predmetov iz predhodnih semestrov:

- Vhodne-izhodne naprave
- Organizacija računalnikov

The following subjects from previous semesters:

- Input-Output Systems
- Computer Organisation

Vsebina:

1. UVOD:

- Uvod in opis vgrajenih sistemov
- Problematika: izvajanje v realnem času, velikost pomnilnika, velikost kode

2. MIKROKRMILNIKI:

- Mikrokrmilniki za vgrajene sisteme
- Zgled: 8-bitni mikrokrmilniki Microchip PIC, arhitektura
- Zgled: 32-bitni mikrokrmilniki ARM, arhitektura, Cortex M4

3. POMNILNIKI, V/I NAPRAVE:

- osnovne VI naprave v mikrokrmilnikih (časovniki, GPIO, A/D, D/A)
- vodila v vgrajenih sistemih (AHB/APB)
- tvorba ure in upravljanje z uro
- časovniki, pulzno-širinska modulacija
- komunikacijski vmesniki in protokoli (USART, SPI, I2C)
- prekinitve, prekinitveni krmilnik
- A/D pretvorniki
- pomnilniki in pomnilniški čipi

4. NAČRTOVANJE STROJNE OPREME

- osnove elektronike
- napajalniki
- tiskana vezja

5. PROGRAMSKA OPREMA IN OS:

- programska oprema za vgrajene sisteme: zbirniki, povezovalniki, razvojna okolja
- programiranje s prekinitvami in prekinitveni mehanizmi, prekinitveni krmilniki
- sistemi v realnem času, principi razvrščanja opravil
- praktično načrtovanje preprostega razvrščevalnika s časovnim rezinjenjem

Content (Syllabus outline):

1. INTRODUCTION

- Introduction to embedded systems
- Goals: real time execution, memory size, code size

2. MICROCONTROLLERS

- Microcontrollers for embedded systems
- Microchip PIC 8-bit microcontroller
- ARM 32-bit microcontrollers, Cortex M4

3. MEMORIES, I/O DEVICES

- Basic devices in microcontrollers (timers, GPIO, A/D, D/A)
- embedded buses (AHB/APB)
- clock generation and management
- Communication interfaces and protocols (USART, SPI, I2C)
- timers and PWM
- interrupts and interrupt controller
- A/D converters
- Memories and memory chips

4. HARDWARE DESIGN

- Introduction to electronics
- Power supplies
- PCB

5. SOFTWARE DESIGN AND OS

- System software for embedded systems: assembler, linker, compiler, IDEs
- Programming with interrupts, interrupt controllers
- Real-time systems, task scheduling
- Example: a simple scheduler
- RTOS, embedded linux

6. ADVANCE TECHNIQUES

- Multiprocessors embedded systems
- SoC

e) RTOS, linux za vgrajene sisteme
6. NAPREDNE TEHNIKE:

- a) večprocesorski vgrajeni sistemi
- c) vgrajeni sistemi na čipu

Temeljni literatura in viri / Readings:

- The definitive guide to the ARM Cortex-M3. Joseph Yiu. Newnes/Elsevier, 2010.
- Embedded Systems: Real-Time Interfacing to Arm Cortex(TM)-M Microcontrollers. Jonathan W. Valvano, CreateSpace, 2011.
- Embedded Systems: Embedded Systems: Real-Time Operating Systems for the Arm Cortex-M3. Jonathan W. Valvano, CreateSpace, 2012.
- ARM Systems Developer's Guide. Andrew Sloss, Dominic Symes, Chris Wright. Morgan Kaufman, 2004.
- Designing Embedded Systems with PIC Microcontrollers: Principles and Applications. Tim Wilmshurst. Elsevier, 2007.
- Linux for Embedded and Real-Time Applications. Doug Abbot. Elsevier, 2006.

Cilji in kompetence:

Cilj predmeta je študentom računalništva in informatike predstaviti osnovne pristope pri načrtovanju vgrajenih sistemov, predstaviti aktualne gradnike vgrajenih sistemov (mikrokrmilnike, pomnilnike ter V/I naprave), programska razvojna orodja ter operacijske sisteme za vgrajene naprave in njihove lastnosti.

Objectives and competences:

The course aim is to present students of computer science the basic approaches in the design of embedded systems, to present the actual building blocks of embedded systems (microcontrollers, memory and I / O devices), software development tools and operating systems for embedded devices and their properties.

Predvideni študijski rezultati:

Znanje in razumevanje:

Poznavanje osnovnih pojmov vgrajenih sistemov ter strojne in programske opreme, delovanja mikrokrmilnikov, pomnilniških tehnologij in VI naprav v vgrajenih sistemih. Razumevanje principov programiranja v zbirniku in C, uporabe prekinitvenih mehanizmov delovanja sistemskih programov v realnem času. Razumevanje krmiljenja naprav in zajema podatkov ter osnovnih komunikacijskih protokolov.

Intended learning outcomes:

Knowledge and understanding:

Knowledge of the basic concepts of embedded systems, the basic concepts of hardware and software, microcontrollers, memories, and IO in embedded systems. Understanding the principles of embedded programming in assembler and C, the use of interrupt mechanisms and real-time programs. Understanding the control and data acquisition devices and basic communication protocols.

Uporaba:

Znanja, pridobljena pri tem predmetu, spadajo med specialna računalniška znanja. Sposobnost samostojnega in praktičnega načrtovanja vgrajenih računalniških sistemov je močno orodje v rokah bodočih računalniških inženirjev. Pridobljena znanja so zelo praktična in jih študenti neposredno uporabijo za implementacijo delujočih naprav.

Refleksija:

Spoznavanje in razumevanje uglasenosti med teorijo in njeno aplikacijo na konkretnih primerih s področja načrtovanja in implementacije vgrajenih računalniških sistemov.

Prenosljive spretnosti - niso vezane le na en predmet:

Spretnosti uporabe domače in tuje literature in drugih tehniških virov (application notes, whitepapers, ...), zbiranja in interpretiranja podatkov, identifikacija in reševanje problemov pri načrtovanju strojne in programske opreme za vgrajene sisteme, kritična analiza in ocena implementacije konkretnega sistema, pisanje tehniških poročil in dokumentacije, delo v načrtovalskem inženirskem timu.

Application:

Student with skills gained in this course will be capable of designing, programming, and valuating embedded systems. Acquired skills are very practical and can be directly used for implementation of embedded systems.

Reflection:

Awareness and understanding of connection between the theory and its application in the field of design and implementation of embedded systems.

Transferable skills:

Capability of reading and understanding domestic and foreign technical literature as well as other and other technical resources (application notes, whitepapers, ...), identifying and solving problems in the design of hardware and software for embedded systems, critical analysis and evaluation of a particular system implementation, writing technical reports and work a team.

Metode poučevanja in učenja:

Predavanja, seminarji, laboratorijske vaje, projektno delo na laboratorijskih vajah, individualne domače naloge.

Learning and teaching methods:

Lectures, laboratories, homeworks.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):		Type (examination, oral, coursework, project):
Sprotno preverjanje (domače naloge, kolokviji in projektno delo)	50%	Continuing (homework, midterm exams, project work)
Končno preverjanje (pisni in ustni izpit)	50%	

<p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>		<p>Final (written and oral exam) Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

- AVRAMOVIĆ, Aleksej, BABIĆ, Zdenka, RAIČ, Dušan, STRLE, Drago, BULIĆ, Patricio. An approximate logarithmic squaring circuit with error compensation for DSP applications. *Microelectronics journal*, 2014, vol. 45, iss. 3, str. 263-271.
- ČEŠNOVAR, Rok, RISOJEVIĆ, Vladimir, BABIĆ, Zdenka, DOBRAVEC, Tomaž, BULIĆ, Patricio. A GPU implementation of a structural-similarity-based aerial-image classification. *J. supercomput.*, Aug. 2013, vol. 65, no. 2, str. 978-996.
- BULIĆ, Patricio, GUŠTIN, Veselko, ŠONC, Damjan, ŠTRANCAR, Andrej. An FPGA-based integrated environment for computer architecture. *Comput. appl. eng. educ.*, Mar. 2013, vol. 21, no. 1, str. 26-35.
- LOTRIČ, Uroš, BULIĆ, Patricio. Applicability of approximate multipliers in hardware neural networks. *Neurocomputing*, Nov. 2012, vol. 96, str. 57-65.
- BABIĆ, Zdenka, AVRAMOVIĆ, Aleksej, BULIĆ, Patricio. An iterative logarithmic multiplier. *Microprocess. microsystem.*, 2011, vol. 35, no. 1, str. 23-33.

Celotna bibliografija izr. prof. Patricia Bulića je dostopna na SICRISu:
<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=11542>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Vzporedni in porazdeljeni sistemi in algoritmi

Course title: Parallel and Distributed Systems and Algorithms

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	3	zimski
Professional study program Computer and Information Science, 1st cycle	none	3	fall

Vrsta predmeta / Course type

izbirni predmet /elective course

Univerzitetna koda predmeta / University course code:

63735

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	10	20	/	/	105	6

Nosilec predmeta / Lecturer:

izr. prof. Patricio Bulić

Jeziki /

Predavanja / Lectures: slovenščina
Slovene

Languages:

Vaje / Tutorial: slovenščina
Slovene

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

Prerequisites:

Vpis naslednjih predmetov iz predhodnih semestrov:

- Algoritmi in podatkovne strukture 1 in 2

The following subjects from previous semesters:

- Algorithms and Data Structures 1 and 2

Vsebina:

1. Uvod: cilji paralelizacije
2. Flynnova klasifikacija računalniških sistemov, večprocesorski, večjedrni in večračunalniški sistemi
3. Amdahlov zakon in vpliv na pohitritev, problemi in upravičenost paralelnih sistemov
4. Principi doseganja vzporednosti: podatkovni in funkcijski paralelizem, cevovodno izvajanje in replikacija
5. Zagotavljanje skladnosti v predpomnilnikih. Komunikacija in koordinacija. Prepreke, medsebojno izključevanje, pogojne spremenljivke.
6. Konkretna arhitekture in paralelno programiranje: rahlo sklopljeni računalniki in MPI, tesno sklopljeni računalniki in OpenMP, mnogojedrne arhitekture in CUDA/OpenCL
7. Paralelni algoritmi, analiza in programiranje: nerodno paralelni algoritmi, deli in vladaj, razprši in združi, dospodar suženj. Analiza algoritmov. Pohitritev.
8. Porazdeljeni sistemi. Napake v mreži. Razpoložljivost.
9. Zmogljivost paralelnih in distribuiranih sistemov. Vpliv predpomnilnika. Lokalnost. Uravnavanje obremenitve. Razporejanje opravil. Energijska učinkovitost.
10. Teoretični modeli paralelnega računanja (PRAM, BSP). Modeli izmenjevanja sporočil (CSP).

Content (Syllabus outline):

1. Introduction. Goals of parallelization.
2. Flynn's taxonomy
3. Amdahl's law, speedup.
4. Basic principles: pipelining and replication, data and functional parallelism
5. Cache coherency. Communication and coordination. Mutual exclusion, barriers, conditional variables.
6. Parallel computers and MPI. Multiprocessors and OpenMP. Manycores and CUDA/OpenCL.
7. Parallel algorithms, analysis and programming: concepts and examples (embarrassingly parallel algorithms, divide and conquer, map reduce, master slave), analysis, speedup.
8. Distributed systems: network- and node-based faults, availability.
9. Parallel performance: load balancing, scheduling and contention, communication overhead, cache effects, spatial and temporal data locality, energy efficiency
10. Theoretical models of parallel computing: formal models of parallel computation (PRAM, BSP), formal models of message passing (CSP).

Temeljni literatura in viri / Readings:

1. Jason Sanders, Edward Kandrot. CUDA by Example: An Introduction to General-Purpose GPU Programming. Addison-Wesley, 2010.
2. G. Couloris et al. Distributed Systems: Concepts and Design. Pearson, 2013.
3. David Kirk, Wen-Mei W. Hwu. Programming Massively Parallel Processors: A Hands-On Approach. Morgan-Kaufmann 2010.
4. B.R. Gaster. Heterogeneous Computing with OpenCL. Morgan Kaufmann, 2013.
5. M.J.Quinn. Parallel Programming in C with MPI and OpenMP. McGraw Hill, 2003.
6. P. Pacheco. Parallel Programming with MPI. Morgan Kaufmann, 2011.

Cilji in kompetence:

Cilj predmeta je študentom računalništva in informatike predstaviti osnove vzporednih in porazdeljenih sistemov in algoritmov ter problematike uporabe in načrtovanja takih sistemov.

Objectives and competences:

The course aim is to present students of computer science the basics of parallel and distributed systems and algorithms, the design of such systems and the potential hazards.

Predvideni študijski rezultati:

Znanje in razumevanje:

Poznavanje osnovnih pojmov vzporednih sistemov, klasifikacije vzporednih in porazdeljenih sistemov, paralelnosti na različnih nivojih računalniških sistemov, uporabe, programiranja in načrtovanja vzporednih sistemov ter osnove vzporednih algoritmov.

Uporaba:

Znanja, pridobljena pri tem predmetu, spadajo med specialna računalniška znanja. Sposobnost samostojnega in praktičnega načrtovanja in programiranja vzporednih in porazdeljenih računalniških, sposobnost evalvacije vzporednih in porazdeljenih sistemov.

Refleksija:

Spoznavanje in razumevanje uglasenosti med teorijo in njeno aplikacijo na konkretnih primerih s področja načrtovanja in programiranja vzporednih računalniških sistemov.

Prenosljive spretnosti - niso vezane le na en predmet:

Intended learning outcomes:

Knowledge and understanding:

The course focuses on the basic concepts of parallel and distributed systems, their classification, different levels of parallelism, applications, programming, and basics of parallel algorithm design.

Application:

Student with skills gained in this course will be capable of designing, programming, and valuating parallel and or distributed systems.

Reflection:

Awareness and understanding of connection between the theory and its application on specific parallel and distributed systems.

Transferable skills:

Capability of reading and understanding domestic and foreign technical literature, gathering and interpreting data, identifying and solving problems, critical analysis and evaluation of the usefulness of parallelization of distributed system and/or algorithms.

Spretnosti uporabe domače in tuje literature in drugih tehniških virov, zbiranja in interpretiranja podatkov, identifikacija in reševanje problemov pri programiranju vzporednih sistemov, kritična analiza in ocena uporabnosti konkretnega vzporednega oz. porazdeljenega sistema ali algoritma.

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Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja, seminarji, laboratorijske vaje, projektno delo na laboratorijskih vajah, individualne domače naloge.

Lectures, laboratories, homeworks.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, midterm exams, project work)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail</p> <p>(according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

- AVRAMOVIĆ, Aleksej, BABIĆ, Zdenka, RAIČ, Dušan, STRLE, Drago, BULIĆ, Patricio. An approximate logarithmic squaring circuit with error compensation for DSP applications. *Microelectronics journal*, 2014, vol. 45, iss. 3, str. 263-271.
- ČEŠNOVAR, Rok, RISOJEVIĆ, Vladimir, BABIĆ, Zdenka, DOBRAVEC, Tomaž, BULIĆ, Patricio. A GPU implementation of a structural-similarity-based aerial-image classification. *J. supercomput.*, Aug. 2013, vol. 65, no. 2, str. 978-996.
- BULIĆ, Patricio, GUŠTIN, Veselko, ŠONC, Damjan, ŠTRANCAR, Andrej. An FPGA-based integrated environment for computer architecture. *Comput. appl. eng. educ.*, Mar. 2013, vol. 21, no. 1, str. 26-35.

- BULIĆ, Patricio, DOBRAVEC, Tomaž. An approximate method for filtering out data dependencies with a sufficiently large distance between memory references. *J. supercomput.*, 2011, vol. 56, no. 2, str. 226-244
- BABIĆ, Zdenka, AVRAMOVIĆ, Aleksej, BULIĆ, Patricio. An iterative logarithmic multiplier. *Microprocess. microsystem.*, 2011, vol. 35, no. 1, str. 23-33.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Računalniške komunikacije
Course title:	Computer Communications

Študijski program in stopnja	Študijska smer	Letnik	Semester
Study programme and level	Study field	Academic year	Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	1	poletni
Professional study program Computer and Information Science, 1st cycle	none	1	spring

Vrsta predmeta / Course type

obvezni predmet / compulsory course

Univerzitetna koda predmeta / University course code:

63708

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samost. delo	ECTS
Lectures	Seminar	Tutorial	Laboratory work	Field work	Individ. work	
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer:

izr. prof. dr. Mojca Ciglarič

Jeziki /

Predavanja / Lectures:

slovenščina
Slovene

Languages:

Vaje / Tutorial:

slovenščina
Slovene

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

Prerequisites:

Posebni pogojev za vključitev v delo ni, saj gre za temeljni predmet.

This is an introductory course, there are no prerequisites.

Vsebina:

3. **Uvod:** pomen in vloga računalniških omrežij in interneta.
4. **Osnovni pojmi:** Struktura omrežij: hrbtenica in krajevna omrežja. Arhitektura omrežij: protokolarni skladi, primerjava ISO OSI in TCP/IP.
5. **Aplikacijska plast:** delovanje in izvedba standardnih in nestandardnih aplikacijskih storitev. Pregled standardnih protokolov (HTTP, FTP, SMTP, DNS...).
6. **Predstavitvena in sejna plast:** vsebina in storitve, primeri.
7. **Transportna plast:** storitve, multipleksiranje, povezavni in nepovezavni prenos (TCP in UDP), zanesljiv prenos podatkov, nadzor zamašitev (congestion), izvedba v TCP.
8. **Omrežna plast:** storitve, virtualne zveze in datagrame povezave, delovanje usmerjevalnikov, naslavljanje, primerjava IPv4 in IPv6, temelji usmerjanja.
9. **Povezavna in fizična plast,** krajevna omrežja (LAN): storitve, zaznavanje in odpravljanje napak, protokoli za skupinski prenosni medij. Fizični naslovi (MAC) in preslikava v IP naslove (ARP), delovanje stikal. Ethernet, brezžična omrežja, aktualni standardi (npr. IEEE 802.11x, 802.15, Bluetooth,...). Celularna omrežja, mobilnost. Prenos signalov, prenosni mediji, vrste modulacije.
10. **Osnove omrežne varnosti.** Zanesljivost in zaščita v omrežju. Požarne pregrade, IDS, IPS sistemi. Simetrična in

Content (Syllabus outline):

1. **Introduction:** role of computer communications and the internet.
2. **Fundamentals:** network structure, backbone, local area networks. Network architecture, TCP/IP and ISO OSI protocol stacks.
3. **Application Layer:** standard and non-standard application layer protocols - functionality and implementation (HTTP, FTP, SMTP, DNS...)
4. **Presentation and Session Layer:** contents and services.
5. **Transport Layer:** services, multiplexing, connection-oriented and connectionless transport (TCP and UDP), reliable data transfer, congestion control and implementations in TCP.
6. **Network Layer:** services, virtual circuits, datagram networks, routers, addressing, comparison of IPv4 and IPv6, routing algorithms - classification and operation.
7. **Data Link Layer and Physical Layer:** Local area networks and technologies, services, error detection and correction, multiple access protocols, physical addressing (MAC), relation to IP addresses, ARP protocol, switches and switching. Ethernet, wireless protocols (IEEE 802.11x, 802.15, Blue Tooth, 802.16...). Cellular networks, mobility. Signal transmission, transmission media, modulation.
8. **Network security fundamentals.** Network reliability and protection. Firewall, IDS, IPS. Symmetric and asymmetric cryptography. PKI, digital certificate, authentication protocols.

asimetrična kriptografija, PKI, digitalno potrdilo, avtentikacijski protokoli.

Temeljni literatura in viri / Readings:

1. Mojca Ciglarič, Zoran Bosnić, James F. Kurose, Keith W. Ross: Računalniške komunikacije, Pearson Education, 2014.
2. J.W. Kurose. K. W. Ross: Computer Networking, A top-down approach, 6th ed., Pearson 2012.
3. L. L. Peterson and B. S. Davie: Computer Networks: A Systems Approach, 4th ed., Morgan Kaufmann 2007.
4. D. Mathews: Computer Networking - Internet Protocols in Action, Wiley 2005.

Cilji in kompetence:

Cilj predmeta je celovita predstavitev področja računalniških komunikacij in omrežij ter sodobnih komunikacijskih storitev.

Študent bo pridobil zlasti naslednje kompetence:

- Sposobnost kritičnega razmišljanja
- Sposobnost uporabe informacijsko-komunikacijske tehnologije in sistemov
- Osnovne spretnosti na področju računalništva, vključno s teoretičnimi temelji in praktičnim znanjem
- Sposobnost razumevanja in uporabe računalniškega znanja na drugih tehničnih in drugih področjih (ekonomija, organizacija,...)
- Razumevanje delovanja večplastnih sistemov sodobnih komunikacij
- Sposobnost načrtovanja, razvoja in uporabe omrežnih aplikacij in storitev
- Usposobljenost za načrtovanje, postavljanje in upravljanje manjših omrežij s stikali in brezžičnimi dostopnimi točkami, dodeljevanje omrežnih naslovov, osnovne nastavitve zahtevnejše omrežne opreme
- Zavedanje o varnosti in nevarnosti v omrežnem okolju.

Objectives and competences:

The objective of the course is overview of the wide area of computer communications and modern communication services. The students will gain the following competencies:

- Ability of critical thinking
- Ability to use information-communication technologies and systems
- Basic skills in computer and information science, which includes basic theoretical skills, practical knowledge and skills essential for the field of computer and information science;
- The ability to understand and apply computer and information science knowledge to other technical and relevant fields (economics, organisational science, etc);
- Understanding of layered architectures used in modern communication systems
- Ability to design, implement and manage small network with switches and wireless access points, IP configuration, basic configuration of more complex network equipment.
- Network security awareness, understanding of basic security problems and solutions

- Uporaba temeljnih varnostnih mehanizmov in razumevanje anatomije nekaterih omrežnih napadov.
- Sposobnost razumevanja in reševanja strokovnih izzivov v računalništvu
- Sposobnost skupinskega dela v poslovnem okolju, vodenje manjše strokovne skupine.
- Razvoj profesionalne odgovornosti in etike
- Skladnost z varnostnimi, funkcionalnimi, ekonomskimi in okoljskimi vodili.
- Praktično znanje in spretnosti na področju strojne in programske opreme ter informatike, potrebno za uspešno strokovno delo v računalništvu
- Temeljne računalniške spretnosti, ki so potrebne za nadaljevanje študija na drugi stopnji.

- Usage of basic security mechanisms and understanding anatomy of selected network attacks.
- The ability to understand and solve professional challenges in computer and information science
- The ability of teamwork within the professional environment; management of a small professional team.
- Development of professional responsibility and ethics.
- Compliance with security, functional, economic and environmental principles.
- Practical knowledge and skills of computer hardware, software and information technology necessary for successful professional work in computer and information science.
- Basic skills in computer and information science, allowing the continuation of studies in the second study cycle.

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent razume in uporablja značilno terminologijo komunikacijskega področja, razume arhitekturo, strukturo in tipe omrežij, pozna komunikacijske naprave, uporablja standardne storitve omrežne, transportne in aplikacijske plasti, ter razume osnove administriranja omrežja in omrežne varnosti.

Uporaba:

Uporaba standardnih komunikacijskih protokolov, storitev in varnostnih mehanizmov v svojih rešitvah. Načrtovanje in ocenjevanje primernosti strukture in izvedbe komunikacijskega omrežja.

Refleksija:

Spoznavanje in razumevanje medsebojne soodvisnosti posameznih plasti v različnih večplastnih modelih omrežij in povezava s konkretnimi izvedbami komunikacijskih storitev.

Prenosljive spretnosti - niso vezane le na en predmet:

Reševanje različnih problemov na osnovi večplastnih arhitekturnih modelov storitev.

Intended learning outcomes:

Knowledge and understanding:

The student is familiar with and uses the characteristic terminology in communication area, understands network types as well as networks architecture and structure, knows network equipment, uses standard services within network, transport and application layer, understands network administration and network security fundamentals.

Application:

Student is able to include standard protocols, services and security mechanisms in own solutions. Student is able to design a network and critically assess network structure and implementation.

Reflection:

Learning and understanding mutual co-dependency of architectural layers in different network models. Relation of abstract models to real life communication service implementations.

Transferable skills:

Finding solutions for different problems based on multilayer service architecture models. Problem

Reševanje problemov na osnovi različnih strukturnih modelov omrežij in topologij. Visoka stopnja varnostne ozaveščenosti.

solving based on different structural models of networks and topologies.
High security awareness.

Metode poučevanja in učenja:

Predavanja, vaje, kvizi in individualne domače naloge s pomočjo konzultacij, projektne naloge s poudarkom na timskem načinu dela. Individualno delo poteka tudi s sodobnimi načini komunikacije prek interneta, na forumih, v spletni učilnici, virtualni laboratorij ipd.

Learning and teaching methods:

Lectures, exercises, laboratory work, quizzes, individual homework, consultation, teamwork projects.
Individual work is supported by modern communication means – internet, fora, LMS, virtual laboratory.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

Sprotno preverjanje (domače naloge, kolokviji in projektno delo)

Končno preverjanje (pisni in ustni izpit)

Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).

50%

50%

Type (examination, oral, coursework, project):

Continuing (homework, midterm exams, project work)

Final (written and oral exam)

Grading: 6-10 pass, 5 fail

(according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

ŠKOBERNE, Nejc, MAENNEL, Olaf, PHILLIPS, Iain, BUSH, Randy, ŽORŽ, Jan, CIGLARIČ, Mojca. IPv4 address sharing mechanism classification and tradeoff analysis. IEEE/ACM transactions on networking, ISSN 1063-6692, 2014, vol. 22, no. 2, pp. 391-404.

PORENTA, Jernej, CIGLARIČ, Mojca. Comparing commercial IP reputation databases to open-source IP reputation algorithms. Computer systems science and engineering, ISSN 0267-6192, 2013, vol. 28, no. 1, pp. 1-14.

ŠKOBERNE, Nejc, CIGLARIČ, Mojca. Practical evaluation of stateful NAT64/DNS64 translation. Advances in electrical and computer engineering, ISSN 1582-7445. [Print ed.], 2011, vol. 11, no. 3, pp. 49-54.

PANČUR, Matjaž, CIGLARIČ, Mojca. Impact of test-driven development on productivity, code and tests : a controlled experiment. Information and software technology, ISSN 0950-5849. [Print ed.], Jun. 2011, vol. 53, no. 6, pp. 557-573.

CIGLARIČ, Mojca. Effective message routing in unstructured peer-to-peer overlays. IEE proc., Commun. [Print ed.], October 2005, vol. 152, no. 5, str. 673-678.

Celotna bibliografija je dostopna na SICRISu: <http://sicris.izum.si/search/rsr.aspx?lang=slv&id=8265>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Programiranje 1

Course title: Programming 1

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika Interdisciplinarni univerzitetni študijski program prve stopnje Upravna informatika	ni smeri	1	zimski
Professional study program Computer and Information Science, 1st cycle Interdisciplinary university Study Programme in Administrative Informatics 1 st Cycle	none	1	fall

Vrsta predmeta / Course type

obvezni predmet / compulsory course

Univerzitetna koda predmeta / University course code:

63702

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer:

izr. prof. dr. Janez Demšar

Jeziki /

Predavanja / Lectures:

slovenščina
Slovene

Languages:

Vaje / Tutorial:

slovenščina
Slovene

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

Prerequisites:

Vsebina:

Predavanja obsegajo naslednja poglavja:

1. Izrazi, osnovni podatkovni tipi, spremenljivke
2. Pogojni stavki, zanka *while*
3. Seznami, terke, zanka *for*
4. Podprogrami
5. Delo z datotekami
6. Slovarji in množice
7. Rekurzija
8. Imenski prostori
9. Osnove objektnega programiranja
10. Izjeme
11. Osnove uporabniških vmesnikov, delo z dogodki
12. Izpeljani sezname, generatorji, iteratorji
13. Dodatne teme

Na vajah študentje utrjujejo obravnavano snov na večjem številu programerskih nalog, ki sistematično predstavljajo snov predavanj. Naloge rešujejo na računalnikih ob pomoči učitelja.

Content (Syllabus outline):

The course consists of the following chapters:

1. Expressions, basic data types, variables
2. Conditional expressions, *while* loop
3. Lists, tuples, *for* loop
4. Subroutines
5. Files
6. Dictionaries and sets
7. Recursion
8. Namespaces
9. Basics of object oriented programming
10. Exceptions
11. Basics of user interfaces, working with events
12. List comprehension, generators, iterators
13. Additional topics

Students will solve a larger number of programming exercises related to lectures with help of teaching assistants.

Temeljni literatura in viri / Readings:

- Za začetnike:
M. L. Hetland: *Beginning Python: from novice to professional*, 2nd Ed., Apres, 2008.
- Za študente, ki že znajo programirati:
J. Demšar: *Python za programerje*. 2. izd, Fakulteta za računalništvo in informatiko, 2012.
- Spletne strani in tečaji (Coursera, Udacity, Edx...) za učenje Pythona; izbor je vsakoletno osvežen na spletni strani predmeta.
- Zapiski s predavanj, gradivo za vaje in stari izpiti na domači strani predmeta.

- For beginners:
M. L. Hetland: *Beginning Python: from novice to professional*, 2nd Ed., Apres, 2008.
- For students with previous experience in programming:
J. Demšar: *Python za programerje*. 2. izd. Fakulteta za računalništvo in informatiko, 2012.
- Web pages with tutorials and courses (Coursera, Udacity, Edx...) for learning Python; an updated selection is published annually on the course homepage.
- Lecture notes, exercises and old exams published on the course home page.

Cilji in kompetence:

Cilj predmeta je spoznati osnove algoritmičnega razmišljanja in kodiranja v primerno izbranem programskem jeziku (trenutno Python).

Objectives and competences:

The goal of the subject is to teach the basics of algorithmic thinking and coding in the chosen language (currently Python).

Predvideni študijski rezultati:

Znanje in razumevanje:
Poznavanje osnovnih programskih konstrukтов (spremenljivke, stavki, zanke, podprogrami, ...) in njihova učinkovita uporaba za reševanje manjših programerskih problemov.
Analiza problema in tvorba ustrezne algoritmične rešitve; uporaba ustreznih programerskih prijemov; razlikovanje med slabšimi in boljšimi rešitvami.

Uporaba:
Snov predmeta predstavlja osnovno znanje programiranja in je temelj, na katerem gradi glavnina nadaljevalnih predmetov visokošolskega študija.

Refleksija:

Intended learning outcomes:

Knowledge and understanding:
Understanding of basic structures (variables, sentences, loops, functions) and their efficient use for solving smaller problems. Analysis of a problem and construction of algorithmic solution; use of appropriate coding approaches; distinguishing between better and worse solutions.

Application:
The course teaches the basic programming skills which represents the foundation for most other courses in the study programme.

Reflection:
Understanding of basics of algorithmic thinking and coding.

Spoznavanje osnov algoritmičnega razmišljanja in kodiranja računalniškega programa.

Prenosljive spretnosti - niso vezane le na en predmet:

Poznavanje in učinkovita uporaba osnovnih konceptov programiranja.

Transferable skills:

Understanding and use of programming.

Metode poučevanja in učenja:

Klasična predavanja s sprotno predstavitvijo velikega števila zgledov na računalniku, na vajah reševanje velikega števila manjših programskih nalog, ki so tipična za posamezne dele snovi. Vaje se izvajajo na računalnikih ob pomoči učitelja in demonstratorjev, rešitve se oddajajo prek sistema Moodle.

Learning and teaching methods:

Standard lectures using a number of examples live on computer; individual exercises with solving a large number of problems typical for a corresponding lecture. Exercises are done on computers with a help of teaching assistants, solutions are submitted using Moodle.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Načini ocenjevanja:	Weight (in %)	Assessment:
<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing work (homeworks, midterm exams, project work)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).</p>

Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

DEMŠAR, Janez. Statistical comparisons of classifiers over multiple data sets. *J. mach. learn. res.* [Print ed.], Jan. 2006, vol. 7, str. [1]-30, graf. prikazi. [COBISS.SI-ID [5134420](#)]

DEMŠAR, Janez, LEBAN, Gregor, ZUPAN, Blaž. FreeViz-An intelligent multivariate visualization approach to explorative analysis of biomedical data. *Journal of biomedical informatics*, 2007, vol. 40, no. 6, str. 661-671, ilustr. [COBISS.SI-ID [6188116](#)]

ŠTAJDOHAR, Miha, MRAMOR, Minca, ZUPAN, Blaž, DEMŠAR, Janez. FragViz : visualization of fragmented networks. *BMC bioinformatics*, 2010, vol. 11, str. 1-14, ilustr.

<http://www.biomedcentral.com/content/pdf/1471-2105-11-475.pdf>. [COBISS.SI-ID [7964756](#)]

DEMŠAR, Janez. Algorithms for subsetting attribute values with Relief. *Mach. learn.*. [Print ed.], Mar. 2010, vol. 78, no. 3, str. 421-428, graf. prikazi. [COBISS.SI-ID [7550548](#)]

ŽABKAR, Jure, MOŽINA, Martin, BRATKO, Ivan, DEMŠAR, Janez. Learning qualitative models from numerical data. *Artif. intell.*. [Print ed.], 2011, vol. 175, no. 9/10, str. 1604-1619, ilustr. [COBISS.SI-ID [8324436](#)]

Celotna bibliografija izr. prof. Demšarja je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=9383>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Podatkovno rudarjenje
Course title:	Data Mining

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	poletni
Professional study program Computer and Information Science, 1st cycle	none	2	spring

Vrsta predmeta / Course type izbirni predmet /elective course

Univerzitetna koda predmeta / University course code: 63765

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	10	20	/	/	105	6

Nosilec predmeta / Lecturer: izr. prof. dr. Janez Demšar

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

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

Vpis naslednjih predmetov iz predhodnih semestrov:

- Umetna inteligenca

The following subjects from previous semesters:

- Artificial Intelligence

Vsebina:

Poglavja predavanj obsegajo

- Uvod; motivacijski primeri
- Kratka ponovitev izbranih metod strojnega učenja in statistike
- Vizualizacija podatkov; dobri in slabi primeri iz prakse
- Kombiniranje vizualizacije, strojnega učenja in statistike v podatkovnem rudarjenju
- Diskretizacija zveznih atributov, obravnavanje neznanih vrednosti in delo s šumnimi podatki s kombinacijo avtomatskih metod in ekspertnega znanja
- Metode za izbiranje atributov, odkrivanje interakcij in sestavljanje atributov
- Pogosti scenariji v odkrivanju zakonitosti
 - a. napovedovanje izjem
 - b. delo z neuravnoteženimi razredi
 - c. cenovno občutljivo učenje
 - d. priporočilni sistemi
 - e. napovedovanje prebegov in podobni problemi
- Uporaba znanih orodij

Content (Syllabus outline):

The course is divided into the following lectures

1. Introduction, motivation
2. Refreshment of machine learning and statistics
3. Data visualization, good and bad examples
4. How to combine visualization, machine learning and statistics
5. Discretization of continuous data; handling unknown and noisy data using a combination of automated methods and expert's knowledge
6. Methods for variable selection and construction, and discovery of interactions
7. Common scenarios in data mining:
 - a. Rare event prediction
 - b. Working with unbalanced classes
 - c. Cost-sensitive prediction
 - d. Recommendation systems
 - e. Churn prediction and similar problems
8. Introduction to popular data mining tools

Temeljni literatura in viri / Readings:

1. F. Witten, E. Frank: *Data Mining: Practical Machine Learning Tools and Techniques*, Morgan Kaufmann, 2005.
2. S. Few: *Now You See It: Simple Visualization Techniques for Quantitative Analysis*, Analytics Press, 2009.
3. E. R. Tufte: *The Visual Display of Quantitative Information, 2nd Edition*, Cheshire, CT: Graphics Press, 2001.

Cilji in kompetence:

Cilj predmeta je študente izuriti v metodah odkrivanja zakonitosti iz podatkov. Študent, ki uspešno opravi ta predmet bi moral biti zmožen v zbranih podatkih poiskati vzorce in hipoteze, ki bi bile praktično uporabne za lastnika podatkov oz. naročnika študije.

Objectives and competences:

The purpose of the course is to teach students how to mine data. After completing the course, the students should be able to use the data for extraction of patterns and hypothesis that should be potentially useful for the data owner.

Predvideni študijski rezultati:**Znanje in razumevanje:**

Poznavanje metod podatkovnega rudarjenja, zmožnost njihove rabe in ovrednotenja njihovih rezultatov.

Uporaba:

Uporaba pri rudarjenju resničnih podatkov.

Refleksija:

Spoznavanje in razumevanje uglasenosti med teorijo in njeno aplikacijo na konkretnih primerih s področja modeliranja podatkov.

Prenosljive spretnosti - niso vezane le na en predmet:

Predmet je osnova za predmet Odločitveni sistemi.

Intended learning outcomes:**Knowledge and understanding:**

Knowledge and understanding of data mining methods, ability to use them and evaluate the results.

Application:

Application on real-world data.

Reflection:

Understanding the relation between the theoretical aspects and practical use of the methods.

Transferable skills:

The course represents the pre-condition for the course in decision systems.

Metode poučevanja in učenja:

Predavanja in vaje, domače naloge, seminarska naloga, praktično delo na umetno generiranih in resničnih podatkih.

Learning and teaching methods:

Lectures, exercises, homeworks and other assignments, practical work on artificial and real-world data.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

Sprotno preverjanje (domače naloge, kolokviji in projektno delo)

Type (examination, oral, coursework, project):

Continuing (homework, midterm exams, project work)

50%

<p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p>	<p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

DEMŠAR, Janez. Statistical comparisons of classifiers over multiple data sets. *J. mach. learn. res.* [Print ed.], Jan. 2006, vol. 7, str. [1]-30, graf. prikazi. [COBISS.SI-ID [5134420](#)]

DEMŠAR, Janez, LEBAN, Gregor, ZUPAN, Blaž. FreeViz-An intelligent multivariate visualization approach to explorative analysis of biomedical data. *Journal of biomedical informatics*, 2007, vol. 40, no. 6, str. 661-671, ilustr. [COBISS.SI-ID [6188116](#)]

ŠTAJDOHAR, Miha, MRAMOR, Minca, ZUPAN, Blaž, DEMŠAR, Janez. FragViz: visualization of fragmented networks. *BMC bioinformatics*, 2010, vol. 11, str. 1-14, ilustr. <http://www.biomedcentral.com/content/pdf/1471-2105-11-475.pdf>. [COBISS.SI-ID [7964756](#)]

DEMŠAR, Janez. Algorithms for subsetting attribute values with Relief. *Mach. learn.* [Print ed.], Mar. 2010, vol. 78, no. 3, str. 421-428, graf. prikazi. [COBISS.SI-ID [7550548](#)]

ŽABKAR, Jure, MOŽINA, Martin, BRATKO, Ivan, DEMŠAR, Janez. Learning qualitative models from numerical data. *Artif. intell.* [Print ed.], 2011, vol. 175, no. 9/10, str. 1604-1619, ilustr. [COBISS.SI-ID [8324436](#)]

Celotna bibliografija je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=9383>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Programiranje 2

Course title: Programming 2

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika Interdisciplinarni univerzitetni študijski program Upravna informatika prve stopnje	ni smeri	1	poletni
Professional study program Computer and Information Science, 1st cycle Interdisciplinary university study programme in Administrative Informatics 1 st cycle	none	1	spring

Vrsta predmeta / Course type

obvezni predmet / compulsory course

Univerzitetna koda predmeta / University course code:

63706

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer:

doc. dr. Tomaž Dobravec

Jeziki /

Predavanja / Lectures:

slovenščina
Slovene

Languages:

Vaje / Tutorial: slovenščina
Slovene

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

Prerequisites:

Vsebina:

Content (Syllabus outline):

1) Osnovno o programiranju

- a. uporaba programskih jezikov za reševanje praktičnih problemov;
- b. predstavitev dobrih praks in pasti programiranja;
- c. predstavite uporabnih programerskih "receptov".

• 2) Osnovni konstrukti programskih jezikov

- a. podatkovni tipi, spremenljivke in konstante;
- b. izrazi, operatorji, strukturiranje kode;
- c. kazalci, dodeljevanje pomnilnika in nizi;
- d. delo z datotekami;

3) Osnove objektnega programiranja

- a. spremenljivke, metode, člani, dostopnostna določila;
- b. razredi, objekti, dedovanje, nadomeščanje;
- c. abstraktni razredi, vmesniki;
- d. dogodkovno vodeno programiranje;
- e. komentarji in dokumentacija.

1) Basic programming skills

- a. using programming languages to solve practical problems;
- b. presentation of good practices and pitfalls of programming;
- c. useful programming "recipes".

2) The building blocks of programming languages

- a. data types, variables and constants;
- b. expressions, operators, structured code;
- c. pointers, memory allocation and arrays;
- d. work with files;

3) Object-oriented programming

- a. variables, methods, members, access modifiers;
- b. classes, objects, inheritance, overriding;
- c. abstract classes, interfaces;
- d. event-driven programming;
- e. comments and documentation.

Temeljni literatura in viri / Readings:

- Brian W. Kernighan, Dennis M. Ritchie. The C Programming Language (2nd edition). Prentice Hall, 1988.
- T. Dobravec. abC. Založba Fe&FRI, 2010.
- K. Arnold, J. Gosling, D. Holmes. The Java Programming Language (3th edition). Addison-Wesley, 2000.
- R. Morelli, R. Walde. Java, Java, Java Object-oriented problem solving (3th edition). Pearson Prentice Hall, 2006.

Cilji in kompetence:

Cilji:

Cilj predmeta je študentom računalništva in informatike predstaviti osnovne principe imperativnega programiranja s poudarki na proceduralnem in objektno usmerjenem jeziku. Poleg pojmov, ki se nanašajo na konkretne programske konstrukte (funkcija, metoda, spremenljivka, operator, delo s pomnilnikom, kazalci, objekt, razred, dedovanje, ...) bodo študentje spoznali tudi pomen splošnih programerskih pojmov, kot so prenosljivost, prevajalnik, navidezni stroj, testiranje, razhroščevanje, ... Vsak študent, ki bo opravil ta predmet, naj bi bil sposoben samostojno reševati srednje zahtevne programerske probleme iz prakse.

Kompetence:

- Razvijanje sposobnosti kritičnega, analitičnega in sintetičnega razmišljanja.

Objectives and competences:

Objectives:

The main goal of the course is to present the basic principles of imperative programming with emphasis on the procedural and object-oriented languages. In addition to concepts related to specific programming constructs (function, method, variable, operator, memory, pointers, object, class, inheritance, ...) students will learn the general programming concepts such as portability, compiler, virtual machine, testing, debugging, ... Each student that will conduct this course should be able to independently solve semi complex programming problems.

Competences:

- Developing skills in critical, analytical and synthetic thinking.

- Sposobnost razumevanja in reševanja strokovnih izzivov na področju računalništva in informatike.
- Sposobnost za uporabo pridobljenega znanja pri samostojnem reševanju tehničnih in znanstvenih problemov v računalništvu in informatiki; sposobnost nadgradnje pridobljenega znanja.
- Osnovna znanja iz računalništva in informatike, ki vključujejo osnovne teoretične spretnosti, praktična znanja in spretnosti, ki so pomembne za področje računalništva in informatike.
- Osnovna znanja na področju računalništva in informatike, ki omogočajo nadaljevanje študija na 2. stopnji.

- The ability to understand and solve professional challenges in computer and information science.
- The ability to apply acquired knowledge in independent work for solving technical and scientific problems in computer and information science; the ability to upgrade acquired knowledge.
- Basic skills in computer and information science, which includes basic theoretical skills, practical knowledge and skills essential for the field of computer and information science;
- Basic skills in computer and information science, allowing the continuation of studies in the second study cycle.

Predvideni študijski rezultati:

Znanje in razumevanje:

Poznavanje osnovnih konstruktor programskih jezikov: podatkovni tip, spremenljivka, konstanta, izraz, operator, funkcija, kazalec, delo s pomnilnikom, nizi, datoteke. Poznavanje osnovnih pojmov objektnega programiranja: objekt, razred, član, metoda, dedovanje, enkapsulacija, nadomeščanje, prekrivanje, vmesniki. Razumevanje pomena splošnih programerskih pojmov, kot so: prenosljivost, prevajalnik, navidezni stroj, testiranje, razhroščevanje.

Uporaba:

Znanja, pridobljena pri tem predmetu, spadajo med osnovna računalniška znanja. Sposobnost samostojnega reševanja praktičnih problemov je večina, ki je izredno uporabna ne samo pri velikem številu predmetov, s katerimi se študent sreča med študijem, pač pa tudi v praksi. Ponavljanje sodobnih programskih jezikov omogoča sorazmerno lahek prehod na druge programske jezike.

Refleksija:

Poznavanje osnovnih programskih jezikov pomaga pri razumevanju delovanja računalnika ter pri

Intended learning outcomes:

Knowledge and understanding:

Basic building blocks of programming languages: data type, variable, constant expression, operator, function, pointer, memory, arrays, files and object-oriented programming (object, class, member, method, inheritance, encapsulation, replacement, overlay, interfaces). Understanding the importance of general programming concepts, such as portability, compiler, virtual machine, testing, debugging.

Application:

Students will gain the basic computer skills and the ability to independently solve practical problems, which is a skill that is extremely useful not only in large numbers of courses with which the student encounters during the study, but also in practice. A good knowledge of the most commonly used languages of modern industry allows relatively easy transition to other languages.

Reflection:

mnogih predmetih, s katerimi se sreča študent računalništva in informatike. Programski jeziki so učinkovito orodje za reševanje industrijskih problemov ter pisanje poslovnih aplikacij.

Prenosljive spretnosti:

Dobro poznavanje programerskih spretnosti omogoča razumevanje delovanja celotnega računalniškega sistema.

Knowledge of basic programming languages helps in understanding how the computer works. Modern programming languages are a powerful tool for solving industrial problems, and writing business applications.

Transferable skills:

Good knowledge of programming skills are very important for understanding how the computer system works.

Metode poučevanja in učenja:

Predavanja, laboratorijske vaje, delavnice.

Learning and teaching methods:

Lectures, exercises and home work.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, midterm exams, project work)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail</p> <p>(according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

MIHELIČ, Jurij, DOBRAVEC, Tomaž. SicSim: A simulator of the educational SIC/XE computer for a system-software course. *Computer applications in engineering education*, ISSN 1061-3773, 2015, vol. 23, no. 1, pp. 137-146

ČEŠNOVAR, Rok, RISOJEVIČ, Vladimir, BABIČ, Zdenka, DOBRAVEC, Tomaž, BULIČ, Patricio. A GPU implementation of a structural-similarity-based aerial-image classification. *The journal of supercomputing*, ISSN 0920-8542, 2013, vol. 65, no. 2, pp. 978-996

BULIČ, Patricio, DOBRAVEC, Tomaž. An approximate method for filtering out data dependencies with a sufficiently large distance between memory references. *The journal of supercomputing*, ISSN 0920-8542, 2011, vol. 56, no. 2, pp. 226-244

DOBRAVEC, Tomaž, ŽEROVNIK, Janez, ROBIČ, Borut. An optimal message routing algorithm for circulant networks. *J. systems archit.* [Print ed.], 2006, vol. 52, no. 5, str. [298]-306

DOBRAVEC, Tomaž, ROBIČ, Borut. Restricted shortest paths in 2-circulant graphs. *Comput. commun.* [Print ed.], March 2009, vol. 32, no. 4, str. 685-690

Celotna bibliografija doc. dr. Dobravca je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=10416>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Programski jezik C
Course title:	The C Programming language

Študijski program in stopnja Study programe and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	Zimski
Professional study program Computer and Information Science, 1st cycle	none	2	Fall

Vrsta predmeta / Course type

Strokovno izbirni predmet/Elective course

Univerzitetna koda predmeta / University course code:

63769

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
15	/	45	/	/	30	3

Nosilec predmeta / Lecturer:

doc. dr. Tomaž Dobravec

Jeziki /

Predavanja / Lectures:

slovenščina
Slovene

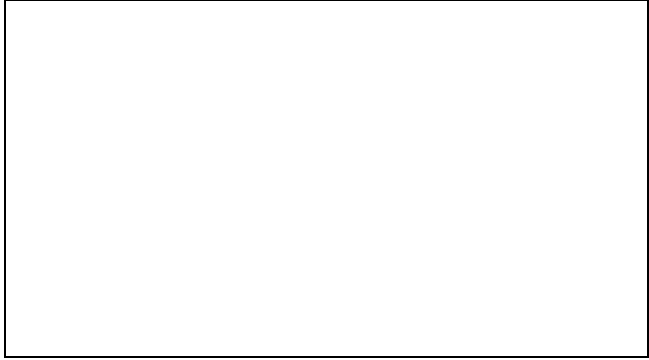
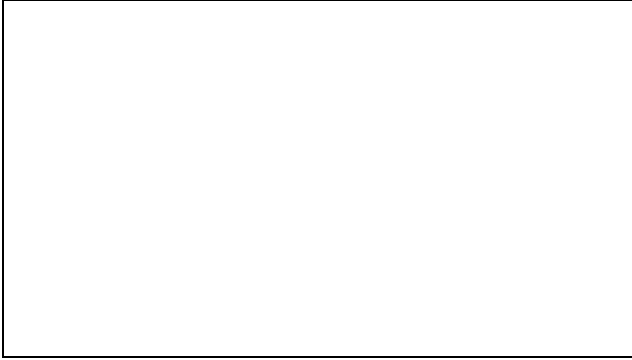
Languages:

Vaje / Tutorial:

slovenščina
Slovene

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

Prerequisites:



Vsebina:

- 1) Osnovni konstrukti programskega jezika C
 - a. podatkovni tipi, spremenljivke in konstante;
 - b. izrazi, operatorji, strukturiranje kode;
 - c. vhod/izhod, delo s tekstovnimi in binarnimi datotekami;
 - d. dinamično delo s pomnilnikom in nizi;
 - e. večdimenzionalne tabele;
 - f. funkcija kot parameter in povratni klici;
 - g. kazalci in neposredni dostop do pomnilnika; podatkovne strukture na osnovi kazalčnih seznamov;
 - h. zaglavja in izdelava knjižnice
 - i. predprocesor, pogojno prevajanje in makro ukazi

- 2) Programiranje v programskem jeziku C
 - a. predstavitev dobrih praks in pasti programiranja v jeziku C;
 - b. predstavite uporabnih programerskih "receptov",
 - c. pregled izvorne kode večjega projekta v jeziku C (gcc)

Content (Syllabus outline):

- 1) Basic elements of C programming language
 - a. data types, variables constants;
 - b. expressions, operators and code structuring;
 - c. input/output, working with text and binary files;
 - d. dynamic memory allocation and strings;
 - e. multidimensional arrays;
 - f. function as a parameter and callbacks;
 - g. pointers and direct memory access; data structures based on linked lists
 - h. headers and custom libraries
 - i. preprocessor, conditional compile and macros

- 2) Programming in the C language
 - a. presentation of good practices and pitfalls of programming;
 - b. presentation of useful programming "recipes";
 - c. testing and debugging C programming code of a big project (gcc)

Temeljni literatura in viri / Readings:

- Brian W. Kernighan, Dennis M. Ritchie. The C Programming Language (2nd edition). Prentice Hall, 1988.
- T. Dobravec. abC. Založba Fe&FRI, 2010.
- R. M. Reese: Understanding and Using C Pointers. O'Reilly Media, 2013

Cilji in kompetence:

Cilj predmeta je študentom računalništva in informatike podrobno predstaviti programski jezik C in njegovo vpetost v praktično vsa področja računalništva. Poleg pojmov, ki se nanašajo na konkretne programske konstrukte (podatkovni tipi, spremenljivke, izrazi, operatorji, strukture, funkcije, datoteke, pomnilnik, kazalci, ...), bodo študentje spoznali programerske pristope, ki se uporabljajo v praksi in načine reševanja problemov. Poleg tega bodo spoznali pomen programiranja v nizkonivojskem jeziku, možnosti dostopa do sistema in vseh njegovih virov. Naučili se bodo izdelati večje programe, ki poleg lastne izvorne kode vsebujejo zunanje knjižnice in kodo drugih avtorjev.

Vsak študent, ki bo opravil ta predmet, bo sposoben samostojno reševati zahtevne programerske probleme, imel bo dober vpogled v delovanje računalniških programov na najnižjem nivoju. Znal bo razumeti in popravljati kodo drugih programerjev (popravljanje in prilagajanje obstoječih programov).

Objectives and competences:

The aim of this course is to present in detail the programming language C and its integration into virtually all areas of computing. In addition to the concepts related to specific programming elements (data types, variables, expressions, operators, structures, functions, files, memory access, pointers, ...), students will learn programming techniques used in practice and ways of solving problems. In addition, they will learn about the impact of the low-level programming language and its ability to access to the system and all system resources. They will learn how to make larger programs using their own source code combined with external code and libraries of other authors.

Each student that will pass the exam will be able to independently solve complex programming problems, having a good insight into the computer programs on the lowest level. Student will be able to understand and fix the code of other programmers.

Predvideni študijski rezultati:**Znanje in razumevanje:**

Poznavanje osnovnih konstruktor programskega jezika C: podatkovni tipi, spremenljivke, izrazi, operatorji, strukture, funkcije, datoteke, pomnilnik, kazalci, ... Poznavanje osnovnih pojmov programiranja v nizkonivojskem jeziku Razumevanje delovanja računalnika na nivoju operacijskega sistema in pomen jezika C za njegovo delovanje.

Uporaba:

Znanja, pridobljena pri tem predmetu, spadajo med osnovna računalniška znanja. Programski jezik C je tako zaradi svoje zasnove in načina delovanja kot tudi zaradi zgodovinskih razlogov zelo pomemben gradnik skoraj vsakega računalniškega sistema. V njem so pisani številni programi in operacijski sistemi. Kljub starosti jezika C se njegov pomen nikakor ne zmanjšuje. Poznavanje jezika pomaga pri razumevanju delovanja računalniškega sistema hkrati pa omogoča pisanje hitrih programov z neposrednim dostopom do sistemskih virov. Številna podjetja imajo velik del programske kode še vedno napisan v programskem jeziku C in potrebujejo programerje za vzdrževanje in dodatni razvoj. Programer z znanjem jezika C je eden od najbolj iskanih profilov.

Refleksija:

Poznavanje programskega jezika pomaga pri razumevanju delovanja računalnika ter pri mnogih predmetih, s katerimi se sreča študent računalništva in informatike. Programski jezik C je učinkovito orodje za reševanje industrijskih problemov ter pisanje poslovnih aplikacij. Uporablja se tudi pri razvoju strojne opreme in pri reševanju problemov na grafičnih karticah (GPE).

Prenosljive spretnosti:

Dobro poznavanje programskega jezika C omogoča razumevanje delovanja celotnega računalniškega sistema.

Intended learning outcomes:**Knowledge and understanding:**

Basic building blocks of the C programming languages: data type, variable, constant expression, operator, function, pointer, memory, arrays, files, Understanding the general concepts of programming in the low-level language. Comprehension of running the compute programs at the operating system level and the importance of the C language for its operation.

Application:

This course covers one of the basic computer skills. Due to its design as well as for historical reasons, the C programming language is very important building block of almost every computer system. It is used in many programs and operating systems. Knowing the C language helps us to understand how a computer system works and at the same time allows us to write quick programs with direct access to system resources. Many companies have a large piece of code the is still written in the C programming language and they require programmers for maintenance and further development. Programmers with knowledge of the C programming language are one of the most desirable employees.

Reflection:

Knowledge of basic programming languages helps in understanding how the computer works . Programming language C is a powerful tool for solving industrial problems, and writing business applications. It is also used in a hardware design process and for parallel solving problems on GPU.

Transferable skills:

Good knowledge of programming skills are very important for understanding how the computer system works.

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Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja, laboratorijske vaje, domače naloge.	Lectures, exercises and home work
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):		Type (examination, oral, coursework, project):
Sprotno preverjanje (domače naloge in projektno delo)	50%	Continuing (homework, project work)
Končno preverjanje (pisni izpit)	50%	Final: (written exam)
Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).		Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

1. MIHELIČ, Jurij, DOBRAVEC, Tomaž. SicSim : a simulator of the educational SIC/XE computer for a system-software course. Computer applications in engineering education. 2015, vol. 23, no. 1, pp. 137-146.
2. ČEŠNOVAR, Rok, RISOJEVIČ, Vladimir, BABIČ, Zdenka, DOBRAVEC, Tomaž, BULIČ, Patricio. A GPU implementation of a structural-similarity-based aerial-image classification. The journal of supercomputing. vol. 65, no. 2, str. 978-996. 2013.
3. BULIČ, Patricio, DOBRAVEC, Tomaž. An approximate method for filtering out data dependencies with a sufficiently large distance between memory references. The journal of supercomputing. vol. 56, no. 2, str. 226-244. 2011.
4. DOBRAVEC, Tomaž, ROBIČ, Borut. Restricted shortest paths in 2-circulant graphs. Computer communications. vol. 32, no. 4, str. 685-690. 2009.
5. DOBRAVEC, Tomaž, ŽEROVNIK, Janez, ROBIČ, Borut. An optimal message routing algorithm for circulant networks. Journal of Systems Architecture. vol. 52, no. 5, str. 298-306. 2006.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Diskretne strukture

Course title: Discrete Structures

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika Interdisciplinarni univerzitetni študijski program Upravna informatika prve stopnje	ni smeri	1	zimski
Professional study program Computer and Information Science, 1st cycle Interdisciplinary university study programme in Administrative Informatics 1 st cycle	none	1	fall

Vrsta predmeta / Course type

obvezni predmet / compulsory course
izbirni predmet / elective course

Univerzitetna koda predmeta / University course code:

63705

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30		/	105	6

Nosilec predmeta / Lecturer:

prof. dr. Gašper Fijavž

Jeziki /

Predavanja / Lectures: slovenščina
Slovene

Languages:

Vaje / Tutorial: Slovenščina

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

- Naravna števila. Indukcija.
- Izjavni račun. Resničnostna tabela izjavnega izraza. Konstrukcijsko drevo izjavnega izraza. Nabori izjavnih veznikov. Sklepanje v izjavnem računu. Osnovno o predikatnem računu.
- Množice, moč množic, funkcije. Osnove preštevanja.
- Relacije. Lastnosti relacij. Graf relacije. Operacije z relacijami in lastnosti. Ekvivalenčna relacija.
- Osnove teorije števil. Razširjeni Evklidov algoritem. Linearne diofantske enačbe. Modulska aritmetika.
- Permutacije. Potenciranje permutacij. Zapis permutacije kot produkt transpozicij. Parnost permutacij.
- Grafi. Izomorfizem, operacije, družine. Podgrafi, vpeti in inducirani podgrafi. Sprehodi v grafih in povezanost, drevesa, gozdovi. Eulerjev in Hamiltonov problem. Barvanja grafov.
- Linearne rekurzivne enačbe s konstantimi koeficienti. Homogene in nehomogene.

vaje :

Vaje so deloma avditorne in so namenjene skupinskemu utrjevanju obravnavane snovi z

Content (Syllabus outline):**lectures:**

- Natural numbers: induction principle.
- Propositional calculus: truth tables, construction trees, complete sets of connectives, formal reasoning, basics of predicate calculus.
- Naive set theory: operations, mappings, basics of counting.
- Relations: properties and operations, equivalence relations, partial orders. Graph of relation.
- Number theory: extended Euclidean algorithm, linear Diophantine equations, modular arithmetic.
- Permutations: computing with permutations, parity, conjugate permutations.
- Graph theory: isomorphism, operations, graph families, vertex degrees, subgraphs, connectivity, trees and forests, Euler and Hamilton graphs, graph colorings.
- Linear recurrence relations with constant coefficients. Homogeneous and nonhomogeneous.

exercise groups:

računskimi primeri s pomočjo asistenta. Delno vaje potekajo laboratorijsko, s samostojnim delom študentov z računalnikom. Pri laboratorijskih vajah se uporablja programska oprema za simbolično računanje (Mathematica, npr.).

domače naloge:

Domače naloge so predvidene v tedenskem ritmu in obvezne. Vsebine domačih nalog praviloma sledijo temam iz kontaktnih ur.

Exercise group time is in part devoted to the classical blackboard approach; the students solve computational problems with some help of TA. In part of the exercise groups the students individually solve computerized versions of problems using symbolic computation software.

homework:

Homework assignments are distributed on a weekly basis. The assignments are obligatory. Their purpose is to prepare the students for continuously working on the DS topics.

Temeljna literatura in viri / Readings:

1. G. Fijavž, Diskretne strukture, Ljubljana, 2014, <http://matematika.fri.uni-lj.si/ds/ds.pdf>. (dodatno)
2. V. Batagelj, S. Klavžar: DS1, DMFA, Ljubljana, 1997.
3. V. Batagelj, S. Klavžar: DS2, DMFA, Ljubljana, 2000.
4. R. J. Wilson, J. J. Watkins: Uvod v teorijo grafov, DMFA, 1997.
5. P. Grossman: Discrete mathematics for computing, Macmillan, 2002.
6. J. L. Hein: Discrete Structures, Logic, and Computability, Jones & Bartlett, 2001.

Cilji in kompetence:

Zmožnost kritičnega razmišljanja.

Razvoj veščin kritičnega, analitičnega in sintetičnega razmišljanja.

Cilj predmeta je poglobiti študentovo razumevanje matematične logike in formalnega sklepanja ter študenta seznaniti z osnovami kombinatorike in diskretne matematike.

Objectives and competences:

Ability of critical thinking.

Developing skills in critical, analytic and synthetic thinking.

The object of the course is to deepen student's understanding of mathematical logic and formal reasoning, together with the basics of discrete mathematics.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po zaključku tega predmeta bo študent sposoben izkazati znanje in razumevanje osnovnih principov diskretne matematike, matematične logike in njune uporabe v računalništvu.

Uporaba:

Uporaba metod matematične logike in diskretne matematike pri načrtovanju računalniških postopkov in programov.

Intended learning outcomes:

Knowledge and understanding:

After successfully finishing the course a student will master the basic principles of discrete mathematics, mathematical logic and their application in CS.

Application:

Using mathematical logic and discrete mathematics in algorithm design.

Refleksija:

Spoznavanje matematičnega jezika za konsistentno in natančno opisovanje pojavov in razumevanje odnosa med teoretičnim modelom in njegovo implementacijo na različnih področjih računalništva.

Prenosljive spretnosti - niso vezane le na en predmet:

Matematična abstrakcija pojmov in problemov je v računalništvu potrebna in pogosto uporabljana.

Reflection:

Using mathematical formalization to accurately and consistently describe the relation between a theoretical model and its implementation.

Transferable skills:

Mathematical abstraction is frequently needed in all areas of computer and information science.

Metode poučevanja in učenja:

Predavanja, vaje z ustnimi nastopi in delom z računalniki, domače naloge. Poseben poudarek je na sprotne študiju z domačimi nalogami, na samostojnem delu z računalnikom in uporabo programske opreme za simbolično računanje.

Learning and teaching methods:

Lectures, exercise groups, homework assignments. The focus lies in continuous work with home assignments, using computer and symbolic computation software.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji)</p> <p>Končno preverjanje (izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, midterm exams)</p> <p>Final (written exam)</p> <p>Grading: 6-10 pass, 5 fail</p> <p>(according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:**Pet najpomembnejših del:**

1. FIJAVŽ, Gašper. Minor-minimal 6-regular graphs in the Klein bottle. *Eur. j. comb.*, 2004, vol. 25, no. 6, str. 893-898. [COBISS.SI-ID [13177433](#)]

2. FIJAVŽ, Gašper. Contractions of 6-connected toroidal graphs. *J. comb. theory, Ser. B*, 2007, vol. 97, no. 4, str. 553-570. [COBISS.SI-ID [14332761](#)]

3. FIJAVŽ, Gašper, WOOD, David Richard. Graph minors and minimum degree. *Electron. j. comb. (On line)*. [Online ed.], 2010, vol. 17, no. 1, r151 (30 str.).
http://www.combinatorics.org/Volume_17/PDF/v17i1r151.pdf. [COBISS.SI-ID 1581320].

4. DUJMOVIĆ, Vida, FIJAVŽ, Gašper, JORET, Gwenaël, SULANKE, Thom, WOOD, David Richard. On the maximum number of cliques in a graph embedded in a surface. *European journal of combinatorics*, ISSN 0195-6698, 2011, vol. 32, no. 8, str. 1244-1252.

5. FIJAVŽ, Gašper, PISANSKI, Tomaž, RUS, Jernej. Strong traces model of self-assembly polypeptide structures. *MATCH Communications in Mathematical and in Computer Chemistry*, ISSN 0340-6253, 2014, vol. 71, no. 1, str. 199-212.

Celotna bibliografija je dostopna na SICRISu: <http://sicris.izum.si/search/rsr.aspx?lang=slv&id=9390>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Izbrana poglavja iz računalništva in informatike

Course title: Topics in Computer and Information Science

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Univerzitetni študijski program prve stopnje Računalništvo in informatika	ni smeri	2, 3	zimski

University study programme Computer and Information Science, 1st cycle	none	2, 3	fall
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Vrsta predmeta / Course type

izbirni predmet / elective course

Univerzitetna koda predmeta / University course code:

63749

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer:

Gostujoči profesorji z drugih univerz/ visiting professors from other universities

Jeziki /

Predavanja / Lectures:

Slovenščina, angleščina

Languages:

Slovene, English

Vaje / Tutorial:

Slovenščina, angleščina

Slovene, English

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

Prerequisites:

Vsebina:

Content (Syllabus outline):

Predmet je namenjen predstavitvi izbranih tem, ki so zanimiva zaradi novih teoretičnih odkritij, nedavnih metodoloških prebojev ali pa zaradi velike uporabnosti v praksi, ter kot taka niso zajeta v ostalih predmetih v programu. Predmet je med drugim namenjen tudi vključevanju uveljavljenih zunanjih in predavateljev v pedagoški proces na FRI.

Podrobna vsebina se določi vsako leto posebej glede na predloge in strokovno usmeritev izbranega predavatelja.

The course is intended for introducing students to topics which are interesting due to recent theoretical findings, methodological breakthroughs or for their applicative value, and are as such not included into the existing curriculum. The course is also intended also for including visiting established researchers and lecturers in lectures at FRI. The specific topic is determined yearly.

Temeljna literatura in viri / Readings:

Temeljna literatura se predpiše vsako leto posebej glede na vsebino in predloge izbranega predavatelja.

Determined yearly, with respect to the current topic of the course.

Cilji in kompetence:

Cilj predmeta je spoznati metodološke osnove in praktične implementacije ter uporabo izbranih najnovejših pristopov in tehnologij s področja računalništva in informatike.

Objectives and competences:

The goal of the course is to introduce basic methodological concepts as well as practical implementations and the use of specific recent approaches and technologies in computer and information science

Predvideni študijski rezultati:

Znanje in razumevanje:

Študenti spoznavajo nova področja in prijeme, ki v obstoječem predmetniku še niso zajeta.

Uporaba:

Uporaba najnovejših pristopov in tehnik z izbranega področja računalništva in informatike.

Refleksija:

Razumevanje primernosti izbranih pristopov s področja računalništva in informatike za reševanje praktičnih primerov v poslovnih okoljih.

Intended learning outcomes:

Knowledge and understanding:

A broader overview and understanding of the field of study, and of up to date methods and concepts.

Application:

Applying current approaches and techniques from the specific field of computer and information science.

Reflection:

Understanding the advantages of the chosen approaches in computer and information science in solving specific practical tasks.

Prenosljive spretnosti - niso vezane le na en predmet:
Reševanje kompleksnih problemov, razvoj kompleksnih sistemov.

Transferable skills:
Solving complex problems, designing complex systems.

Metode poučevanja in učenja:

Predavanja, laboratorijske vaje

Learning and teaching methods:

Lectures, lab exercises

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, midterm exams, project work)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Digitalno procesiranje signalov
Course title:	Digital Signal Processing

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	zimski
Professional study program Computer and Information Science, 1st cycle	none	2	fall

Vrsta predmeta / Course type izbirni predmet /elective course

Univerzitetna koda predmeta / University course code: 63744

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer: prof. dr. Franc Jager

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

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

**Vsebina:**

Temeljni cilj je predstavitev sistemov, orodij in metod za digitalno procesiranje signalov (DPS). Digitalni signali in metode za njihovo analizo ter obdelavo so dandanes nepogrešljivi del večine računalniških sistemov, ki nezadržno prodirajo v naše življenje; še posebej pa tovrstno znanje postaja pomembno za bodoče računalniške strokovnjake. Zato pri tem predmetu spoznamo to področje s poudarkom na praktičnem vidiku poznavanja in uporabe najpomembnejših metod s tega področja na najbolj razširjenih vrstah digitalnih signalov (zvoki, slike).

Pregled vsebine predavanj:

1. Uvod v digitalno procesiranje signalov
2. Osnove vzorčenja in rekonstrukcije signalov
3. Diskretni signali in diskretni sistemi
4. Diskretni signali in sistemi v frekvenčnem prostoru
5. Diskretni Fourierov Transform (DFT), FFT algoritem in njuna uporaba
6. Digitalni filtri (KEO, NEO)
7. Načrtovanje digitalnih filtrov
8. Digitalno procesiranje zvočnih, govornih, bioloških in slikovnih signalov
9. Izbrane teme s področja DPS (npr. razpoznavanje govora, analiza EKG signalov, razpoznavanje EEG signalov – komunikacija možgani računalnik, ...)

Na primerih praktične uporabe predvsem na področju obdelave zvoka naj bi študent dobil vpogled v sodobne metode na tem področju in njihovo praktično uporabnost.

Content (Syllabus outline):

The basic objective is to present systems, tools and methods for digital signal processing (DSP).

Digital signals and methods for their analysis and processing are now an indispensable part of most computer systems, which are inexorably penetrating into our life; this kind of knowledge is becoming especially important for future computer professionals. Therefore, in this course, we learn about this area with emphasis on the practical aspect of knowledge and application of the most important methods in this field to the most widely used types of digital signals (sounds, images).

An overview of the lectures:

1. Introduction to Digital Signal Processing
2. Basics of Sampling and Reconstruction of Signals
3. Discrete-Time Signals and Systems
4. Discrete Signals and Systems in Frequency Domain
5. Discrete Fourier Transform (DFT), FFT algorithm and their applications
6. Digital Filters (FIR, IIR)
7. Digital filter design
8. Digital Signal Processing of Audio, Speech, Biological and Video signals
9. Selected topics from the field of DSP (e.g. speech recognition, analysis of ECG signals, recognition of EEG signals – brain computer communication, ...)

In cases of practical applications particularly in the field of sound processing student should gain insight into modern methods in the field and their practical applicability.

Obravnavamo tudi zanimive aktualne probleme, kot so 3D zvok, razpoznavanje govora, detekcija in analiza zvokov, sinteza instrumentov, analiza bioloških signalov, ...

V okviru laboratorijskih vaj pridobljeno znanje utrjujemo in poglobljamo z reševanjem aktualnih in zanimivih praktičnih primerov. Pri tem spoznavamo predstavljene koncepte tudi s praktičnega vidika.

We will also look inside attractive practical signal processing problems, such as 3D sound, speech recognition, detection and analysis of sounds, sound synthesis of instruments, analysis of biological signals, ...

In the context of laboratory sessions, we consolidate and deepen our knowledge with solving well known and interesting practical examples. In doing so, we learn the presented concepts also from a practical point of view.

Temeljna literatura in viri / Readings:

1. V. Oppenheim, R. W. Schaffer: **Discrete-Time Signal Processing**, Pearson, 2014.
2. J. G. Proakis, D. K. Manolakis: **Digital Signal Processing**, Pearson, 2014.
3. Lyons: **Understanding Digital Signal Processing (3rd Edition)**, Prentice Hall, 2011.
4. Gonzalez Rafael C., Woods Richard E. **Digital Image Processing**, Pearson Prentice Hall., 2008.

Vsa dodatna gradiva so dosegljiva v spletni učilnici.

Cilji in kompetence:

Predstavitev področja digitalnega procesiranja signalov: sistemov, matematičnih orodij in metod za obdelavo ali analizo digitalnih signalov. Na primerih praktične uporabe naj bi študent dobil vpogled v sodobne metode (algoritme) in sisteme DPS.

Predvidene kompetence:

- poznavanje terminologije iz področja digitalnega procesiranja signalov
- praktična znanja in veščine iz aparaturne, programske in informacijske tehnologije potrebna za uspešno strokovno delo na področju računalništva in informatike
- sposobnost uporabe pridobljenega znanja za samostojno reševanje tehničnih in znanstvenih problemov v računalništvu in informatiki; sposobnost nadgradnje pridobljenega znanja
- sposobnost razumevanja in reševanja strokovnih izzivov v računalništvu in informatiki
- napredna analiza digitalnih signalov v časovnem in frekvenčnem prostoru
- načrtovanje in implementacija sistemov za digitalno procesiranje signalov
- poznavanje in realizacija digitalnih filtrov

Objectives and competences:

Presentation of the field of digital signal processing: systems, mathematical tools and methods for processing or analysis of digital signals. With practical cases the student should gain insight into the modern DSP methods (algorithms) and systems.

Planned competencies:

- knowledge of terminology in the field of digital signal processing
- practical knowledge and skills of computer hardware, software and information technology necessary for successful professional work in computer and information science
- the ability to apply acquired knowledge in independent work for solving technical and scientific problems in computer and information science; the ability to upgrade acquired knowledge
- the ability to understand and solve professional challenges in computer and information science
- advanced analysis of digital signals in time and frequency domain
- design and implementation of systems for digital signal processing
- knowledge and implementation of digital filters

- analiza in obdelava zvočnih, govornih, bioloških in slikovnih signalov
- reševanje praktičnih problemov s področja obdelave zvočnih in bioloških signalov
- poznavanje odprtokodnih ali lahko dostopnih orodij za digitalno procesiranje signalov

- analysis and processing of audio, speech, biological and image signals
- solving practical problems in the field of sound and biological signal processing
- knowledge of open source or easily accessible tools for digital signal processing

Predvideni študijski rezultati:

Intended learning outcomes:

Znanje in razumevanje:

Osnovni cilj je pridobiti znanja o postopkih s področja digitalnega procesiranja signalov in njihovi uporabi pri reševanju praktičnih problemov s tega področja.

Uporaba:

Osnovno razumevanje DPS je pomembno za načrtovanje in implementacijo tovrstnih postopkov v sodobnih računalniških, komunikacijskih in multimedijških sistemov.

Refleksija:

Povezati matematične metode in realne digitalne signale ter sisteme za njihovo obdelavo.

Prenosljive spretnosti - niso vezane le na en

predmet:

Predmet se dopolnjuje s predmeti s področij multimedijških sistemov in računalniških komunikacij.

Knowledge and understanding:

The basic objective is to gain knowledge about methods in the field of digital signal processing and their use in computing, communications and multimedia systems.

Application:

Basic understanding of DSP is important for the design and implementation of such procedures in modern computing, communication and multimedia systems.

Reflection:

Connect mathematical methods with realistic digital signals and systems for their processing.

Transferable skills:

Complements the knowledge in the field of multimedia systems and computer communications.

Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja, laboratorijske vaje, domače naloge in seminarji.

Lectures, laboratory sessions, homework assignments and seminars.

Na laboratorijskih vajah spoznavamo praktično vrednost predstavljenih metod pri reševanju aktualnih problemov s tega področja.

In the lab, we learn about the practical value of the presented methods in solving the current problems in this area.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekti):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in seminarji)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, projects):</p> <p>Continuous (homework, midterm exams, seminars)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail</p> <p>(according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

1. AMON, M, JAGER, F. Electrocardiogram ST-segment morphology delineation method using orthogonal transformations. PloS one, Vol. 11(2), pp. 1-18, 2016.
2. TROJNER-BREGAR, A, LUČOVNIK, M, VERDENIK, I, JAGER, F, GERŠAK, K, GARFIELD, R. Uterine electromyography during active phase compared with latent phase of labor at term. Acta obstetricia et gynecologica Scandinavica, Vol. 95(2), pp. 197-202, 2016.
3. PANGERC, U, JAGER, F. Robust detection of heart beats in multimodal records using slope- and peak-sensitive band-pass filters. Physiological measurement, Vol. 36(8), pp. 1645-1664, 2015.
4. JAGER, F. Two chapters in Advanced Methods and Tools for ECG Data Analysis, G. Clifford, F. Azuaje, P.E. McSharry (editors), Artech House, Inc. 2006.
5. JAGER, F, MOODY, G B., MARK, R G. Detection of transient ST segment episodes during ambulatory ECG monitoring. Computers and biomedical research, Vol. 31, pp. 305-322, 1998.

Celotna bibliografija je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=4815>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Osnove verjetnosti in statistike
Course title:	Introduction to Probability and Statistics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	1	poletni
Professional study program Computer and Information Science, 1st cycle	none	1	spring

Vrsta predmeta / Course type obvezni predmet / compulsory course

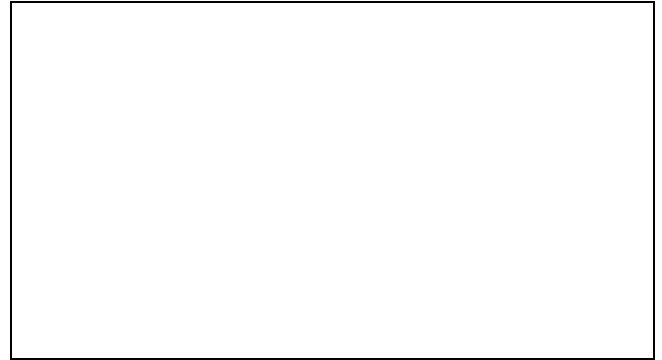
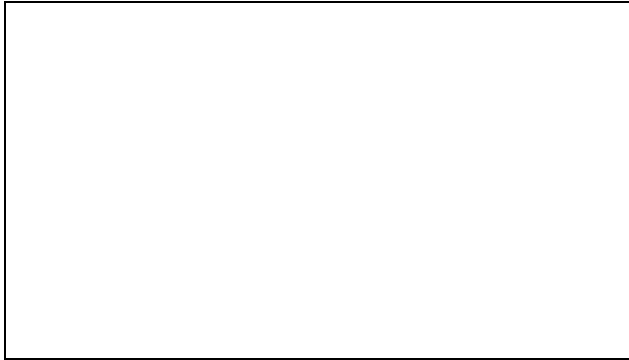
Univerzitetna koda predmeta / University course code: 63710

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer: prof. dr. Aleksandar Jurišić

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

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

**Vsebina:**

Teorija verjetnosti, matematični opis naključij/slučajnosti, je osnova za igre na srečo, zavarovalništvo in velik del moderne znanosti.

Za statistiko *slučajen* ne pomeni *neurejen*. Za slučajnostjo je neke vrste red, ki se pokaže šele na dolgi rok, po velikem številu ponovitev.

Naučili se bomo prepoznati dobre in slabe metode *pridobivanja podatkov*. Vsaka množica podatkov vsebuje informacije o neki skupini posameznikov. Informacije so urejene v spremenljivke. Če podatke uredimo v obliki tabele, potem vsaka vrstica vsebuje podatke o enem *posamezniku*, vsak stolpec pa vsebuje vrednosti ene *spremenljivke* za vse posameznike.

Statistična orodja in ideje nam pomagajo odkriti naravo množice podatkov z uporabo grafov in števil, ki opišejo glavne značilnosti. Tak pristop imenujemo *analiza podatkov*. Začnemo z obravnavo ene spremenljivke, nato si ogledamo povezave med več spremenljivkami.

Statistično sklepanje je proces, pri katerem pridemo do zaključkov na podlagi danih podatkov. Neformalno statistično sklepanje velikokrat temelji na grafični predstavitvi podatkov. Formalno pa sklepanje uporablja verjetnost, da se odločimo do kakšne mere smo lahko prepričani, ali so naši zaključki pravilni, tj. odgovarja na specifična vprašanja s predpisano stopnjo zaupanja.

Content (Syllabus outline):

Probability theory, the mathematical description of randomness/uncertainty, is the basis for gambling, insurance and much of modern science.

In statistics »*random*« is not synonym for »*haphazard*«. Randomness is kind of order that emerges only in the long run, in many repetitions. We will learn to recognize good and bad methods of *producing data*. Each set of data contains information about some group of individuals. If we collect data in the form of table, then each row contains data about the corresponding *individual* and each column contains values of one *variable* for all individuals.

Statistical tools and ideas assist us to uncover the nature of a set of data using graphs and numbers, which describe main attributes. Such study is called *data analysis*. We start with one variable and then check relations among several variables.

Statistical inference is a process which infers conclusions based on given data. Informally, statistical inference is often based on graphical presentation of data. Formally, statistical inference uses probability, to judge till what degree are our conclusions reliable, it answers specific questions with a known degree of confidence.

Predavanja:

- Definicija verjetnosti, računanje z dogodki, pogojna verjetnost, obrazec razbitja in Bayesov obrazec, Bernoullijevo zaporedje neodvisnih poskusov, Laplaceov intervalski obrazec, funkcija napake.
- Slučajne spremenljivke in vektorji, diskretne in zvezne porazdelitve, neodvisnost slučajnih spremenljivk, funkcije slučajnih spremenljivk, funkcije slučajnih vektorjev.
- Matematično upanje, disperzija in višji momenti, zaporedja slučajnih spremenljivk in slučajni procesi, limitni izreki.
- Osnovna naloga statistike, porazdelitve vzorčnih statistik, vzorčno povprečje, reprodukcijska lastnost normalne porazdelitve, hi-kvadrat porazdelitev, Studentova porazdelitev, (intervalno) ocenjevanje parametrov, intervali zaupanja, testiranje statističnih hipotez, analiza variance, kovariance in linearne regresije.

Vaje: Namen vaj pri predmetu Osnove verjetnosti in statistike je dvojen:

1. Utrjevanje pri predavanjih obravnavane snovi z računskimi primeri.
2. Kvalitativna in kvantitativna predstavitev nekaterih tipičnih, vendar »nešolskih« primerov, ki so za študente računalništva in informatike relevantni.

Pri vajah študenti sami rešujejo naloge, zato je udeležba pri vajah obvezna.

Domače naloge in kvizi:

Namen domačih nalog in projektov je ponuditi študentom priložnost za povsem samostojno reševanje nekoliko kompleksnejših nalog iz verjetnosti in statistike, ki poleg računske

Lectures:

1. Definition of probability, algebra of events, conditional probability, Bayes rule, Bernoulli trials, Laplace interval formula, Error function.
2. Random variables and vectors, discrete and continuous distributions, independence, functions of random variables, functions of random vectors.
3. Expected value, standard deviations and higher moments, sequences of random variables and random processes, limit theorems.
4. The main goal of statistics, the sampling distribution of statistics, sample average, reproduction property of the normal distribution, the hi-square distribution, the Student distribution, confidence intervals, estimation, tests of hypotheses, ANOVA, covariance and linear regression.

Tutorials: Purpose of tutorials for the course Introduction to Probability and Statistics:

1. Detailed study of the material from the lectures through examples.
2. Qualitative and quantitative introduction of some typical (real-life) examples that are relevant for students of computer science.

Tutorials are guided, however, students are independently trying to solve problems, so their presence is compulsory.

Homeworks and quizzes:

The purpose of homeworks and projects is to offer students a possibility to independent solving of more complex problems in probability and statistics, which assume beside calculation techniques also

spretnosti zahtevajo tudi nekoliko temeljitejši premislek. Oboje presega možnosti pri vajah in naj bi navajalo k samostojnem delu. Kvizi pa spodbujajo sprotno delo in dajo študentom povratno informacijo o njihovem znanju.

more comprehensive skills. Both exceeds tutorial work and leads students to independent work. Quizzes encourage students to do current work and give them feedback on their knowledge.

Temeljni literatura in viri / Readings:

W. Mendenhall and T. Sincich: Statistics for engineering and the sciences, 5th edition, Pearson-Prentice-Hall, 2007 (prvih 11 poglavij/first 11 chapters).

Dodatna literatura:

1. David S. Moore, Part II, Statistics: The Science of Data, v knjigi For All Practical Purposes (Mathematical Literacy in today's world), urednik S. Garfunkel, Consortium for Mathematics and Its Applications (COMAP), 8. izdaja, W. H. Freeman and Company, 2003 (v pripravi je tudi slovenski prevod).
2. J. Čibej, Matematika, kombinatorika, verjetnostni račun, statistika, DZS, 1994.
3. L. Gonick in W. Smith, *The Cartoon guide to Statistics*, 1993.

Cilji in kompetence:

Cilj predmeta je študentom računalništva in informatike predstaviti osnovne *verjetnosti* in *statistike*.

Objectives and competences:

The aim of this course is to introduce students of computer and information sciences to basics of probability *theory* and *statistics*.

Predvideni študijski rezultati:

Znanje in razumevanje: Poznavanje metod odkrivanja zakonitosti iz podatkov, zmožnost njihove rabe in ovrednotenja njihovih rezultatov.

Uporaba: Uporaba pri odkrivanju zakonitosti iz resničnih podatkov.

Refleksija: Spoznavanje in razumevanje uglasenosti med teorijo in njeno rabo na konkretnih primerih.

Prenosljive spretnosti - niso vezane le na en

Intended learning outcomes:

Knowledge and understanding: Student masters the basic techniques to detect relations from data, and ability to use techniques and to evaluate their results.

Application: The ability to detect certain relations from real data.

Reflection: Learning and understanding the soundness between theory and practice applied to specific examples of probability and statistics.

predmet: Predmet je osnova za številne predmete, pri katerih poznavanje in razumevanje vzorcev v podatkih omogoča kvalitetnejše odločanje in učinkovito rabo virov.

Transferable skills - not related to a single course:
This course is a foundation for several courses, where the study and understanding of data patterns allows better decision making and efficient usage of given sources.

Metode poučevanja in učenja:

Predavanja, računske vaje z ustnimi nastopi, seminarski način dela pri projektih. Poseben poudarek je na sprotne študiju in na skupinskem delu pri vajah in seminarjih. Oglevali si bomo tudi kakšen video.

Learning and teaching methods:

Lectures, tutorials, assignments, projects, office hours, lab work. There will be a special emphasis on real-time studies and team work (tutorials and seminars). We will occasionally watch a video material related to the course material.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Sprotno preverjanje (domače naloge, kolokviji in projektno delo)

50%

On-going coursework (assignments, midterms, project work),

Končno preverjanje (pisni in ustni izpit)

50%

Final (written and oral).

Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).

Failing mark 5 and passing marks 6-10 (according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

1. A. Jurišić and J. H. Koolen, Classification of the family $AT_4(qs, q, q)$ of antipodal tight graphs, *J. Combin. Th. (A)* **118** (2011), 842-852.
2. A. Jurišić, A. Munemasa and Y. Tagami, On graphs with complete multipartite graphs, *Discrete Math.* **310** (2010), 1812-1819.
3. A. E. Brouwer, A. Jurišić in J. Koolen, Characterization of the Patterson graph, *J. Algebra* **320** (2008), 1189-1199.
4. A. Jurišić in P. Terwilliger, Pseudo 1-homogeneous distance-regular graphs, *J. Alg. Combin.* **28** (2008), 509-529.
5. K. Coolsaet in A. Jurišić, Using equality in the Krein conditions to prove nonexistence of certain distance-regular graphs, *J. Combin. Th. (A)* **115** (2008), 1086-1095.

Celotna bibliografija prof. dr. Jurišića je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=6518>.

Celotna bibliografija doc. dr. Oblakove je dostopna na SICRISu:
<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=15808>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Multimedijske tehnologije
Course title:	Multimedia Technologies

Študijski program in stopnja	Študijska smer	Letnik	Semester
Study programme and level	Study field	Academic year	Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	3	zimski
Professional study program Computer and Information Science, 1st cycle	none	3	fall

Vrsta predmeta / Course type izbirni predmet /elective course

Univerzitetna koda predmeta / University course code: 63734

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samost. delo	ECTS
Lectures	Seminar	Tutorial	Laboratory work	Field work	Individ. work	
45	10	20	/	/	105	6

Nosilec predmeta / Lecturer: viš. pred. Alenka Kavčič

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

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

Vpis naslednjih predmetov iz predhodnih semestrov:

- Produkcija multimedijskih gradiv
- Digitalno procesiranje signalov

The following subjects from previous semesters:

- Multimedia Content Production
- Digital Signal Processing

Vsebina:

Predavanja:

- Uvod: vrste digitalnih medijev in medijskih vsebin
- Osnove vizualizacije
- Tekst: predstavitev, indeksiranje in poizvedovanje po zbirkah, rangiranje dokumentov
- Brezizgubno stiskanje podatkov
- Zvok: predstavitev, kodiranje z izgubami (MPEG), sinteza zvoka, obdelava zvoka in zvočni efekti, indeksiranje
- Slika: predstavitev, barve in barvni prostori, kodiranje z izgubami (JPEG), obdelava slik
- Video: predstavitev, kodiranje z izgubami (MPEG), obdelava

Vaje:

Vaje bodo potekale v obliki projektne delo v primerno opremljenih študentskih laboratorijih. Študentje v okviru projektov samostojno implementirajo interaktivne vizualizacije multimedijskih podatkov.

Content (Syllabus outline):

Lectures:

1. Introduction: types of digital media and media contents
2. Introduction to visualization
3. Text: representation, indexing and retrieval in text collections, document ranking
4. Lossless data compression
5. Sound: representation, lossy coding (MPEG), sound synthesis, sound processing and effects
6. Images: representation, colors and color spaces, lossy coding (JPEG), image processing
7. Video: representation, lossy coding (MPEG), processing

Exercises:

Exercises will include project work in computer labs. Projects will include the implementation of interactive visualizations of multimedia data.

Temeljni literatura in viri / Readings:

1. N. Chapman, J. Chapman: Digital Multimedia, Wiley, ISBN 0470512164, 2009.
2. P. Halvadar, G. Medioni: Multimedia Systems: Algorithms, Standards, and Industry Practices, Course Technology, ISBN 9781418835941, 2009.
3. H.M. Blanken, A.P. de Vries, H.E. Blok, L. Feng (eds). Multimedia Retrieval, Springer, ISBN 3642091997, 2010
4. David J. C. MacKay. Information Theory, Inference, and Learning Algorithms Cambridge: Cambridge University Press, 2003. ISBN 0-521-64298-1

Cilji in kompetence:

Cilj predmeta je, da študenti pridobijo znanja in veščine potrebne za uporabo, načrtovanje in razvoj multimedijskih sistemov. Študenti bodo spoznali načine za učinkovito predstavitev, obdelavo in preiskovanje multimedijskih podatkov, kot so besedila, zvok slika in video ter njihovo algoritmično ter programsko ozadje potrebno za razvoj tovrstnih aplikacij.

Študenti bodo pridobili naslednje kompetence:

- razumevanje in reševanje izzivov na področju računalništva in informatike;
- uporabo znanja za samostojno delo pri reševanju tehničnih in znanstvenih problemov na področju računalništva in informatike; sposobnost nadgradnje znanj;
- sposobnost samostojnega izvajanja manj in bolj zahtevnih inženirskih in organizacijskih nalog na ožjih področjih in samostojno reševanje dobro definiranih nalog na področju računalništva in informatike;
- sposobnost samostojnega razvoja interaktivnih multimedijskih aplikacij.

Objectives and competences:

The main objective is for students to gain understanding of the use, design and development of multimedia systems. Students will get to know different ways representing, processing and searching multimedia data including text, sound, images and videos, and gain the algorithmic and programming background needed to develop multimedia applications.

When completing the course, students will be able to gain the following competences:

- the ability to understand and solve professional challenges in computer and information science.
- the ability to apply acquired knowledge in independent work for solving technical and scientific problems in computer and information science; the ability to upgrade acquired knowledge.
- the ability to independently perform both less demanding and complex engineering and organisational tasks in certain narrow areas and independently solve specific well-defined tasks in computer and information science
- the ability to independently develop interactive multimedia applications.

Predvideni študijski rezultati:

Znanje in razumevanje:

Poznavanje računalniških tehnologij in računalniških metodologij za uporabo in razvoj multimedijskih aplikacij in razumevanje kdaj in na kakšen način je njihova uporaba smiselna.

Uporaba:

Razvoj multimedijskih aplikacij.

Refleksija:

Spoznavanje in razumevanje uglasenosti med teorijo in njeno aplikacijo na konkretnih primerih s področja multimedijskih tehnologij.

Prenosljive spretnosti - niso vezane le na en predmet:

Intended learning outcomes:

Knowledge and understanding:

Knowledge of computer technologies and methodologies for the use and development of multimedia applications and understanding of when and how their use makes sense.

Application:

Development of multimedia applications.

Reflection:

Knowing and understanding of the balance between theory and practice on concrete examples from the field of multimedia technologies.

Transferable skills:

Zajem, obdelava, stiskanje teksta, slik, videa, zvoka in drugih multimedijskih vsebin.

Capture, processing, compression of text, images, video, sound and other multimedia contents.

Metode poučevanja in učenja:

Predavanja s praktičnimi demonstracijami, izvajanje laboratorijskega projekta pod mentorstvom asistenta.

Learning and teaching methods:

Lectures with practical demonstrations, laboratory work under the supervision of assistants.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

Sprotno preverjanje (domače naloge, kolokviji in projektno delo)

Končno preverjanje (pisni in ustni izpit)

Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).

Type (examination, oral, coursework, project):

Continuing (homework, midterm exams, project work)

Final (written and oral exam)

Grading: 6-10 pass, 5 fail

(according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

KAVČIČ, Alenka. Creative use of games in the classroom: vabljeno predavanje. *eTwinning contact seminar Game based learning in the future classroom*, 2.-4. 10. 2014, Ljubljana. [COBISS.SI-ID 1536025539]

KAVČIČ, Alenka, BOHAK, Ciril, PESEK, Matevž, MAROLT, Matija. Edo: involving teachers in the development of e-learning material. V: *Open education for a multicultural world: OCWC Global Conference*, 23-25 April, Ljubljana, Slovenia. Ljubljana: Jožef Stefan Institute, Centre for Knowledge Transfer in Information Technologies, 2014, str. 1-4. [COBISS.SI-ID 10564948]

KAVČIČ, Alenka. Pomen standardov in specifikacij za elektronska učna gradiva = Importance of standards and specifications for electronic learning materials: vabljeno predavanje. V: *Mednarodna konferenca Splet*

izobraževanja in raziskovanja z IKT - SIRIKT 2011, Kranjska Gora, 13.-16. april 2011, 13th-16th April 2011. BAČNIK, Andreja (ur.), et al. (Zbornik). Ljubljana: Miška, 2011, str. 158-164, ilustr. [COBISS.SI-ID 8307028]

KAVČIČ, Alenka, PRIVOŠNIK, Marko, BOHAK, Ciril, MAROLT, Matija, DIVJAK, Saša. Programiranje in algoritmi skozi primere. 1. izd. Ljubljana: Založba FE in FRI, 2010. IX, 241 str., ilustr. ISBN 978-961-6209-76-2. [COBISS.SI-ID 249928704]

KAVČIČ, Alenka. Fuzzy user modeling for adaptation in educational hypermedia. *IEEE trans. syst. man cybern., Part C Appl. rev.*. [Print ed.], nov. 2004, vol. 34, no. 4, str. 439-449, ilustr. [COBISS.SI-ID 4477012]

Celotna bibliografija je dostopna na SICRISu: <http://sicris.izum.si/search/rsr.aspx?lang=slv&id=9255>.

Complete bibliography is available in SICRIS:

<http://sicris.izum.si/search/rsr.aspx?lang=eng&id=9255>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Uvod v računalništvo
Course title:	Introduction to Computer Science

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	1	zimski
Professional study program Computer and Information Science, 1st cycle	none	1	fall

Vrsta predmeta / Course type obvezni predmet / compulsory course

Univerzitetna koda predmeta / University course code: 63701

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer: izr. prof. dr. Danijel Skočaj

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

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

**Vsebina:**

Vsebina predmeta sega na različna področja računalništva in informatike, od algoritmičnih osnov računalništva, preko strojne in programske opreme do aplikacij. Študente se seznanijo z osnovami različnih področij in jim predstavi disciplino računalništva in informatike kot celoto, ne da bi se spuščali v globino na posameznih področjih.

Vsebina predmeta sledi poglavjem osnovne študijske literature (glej spodaj).

1. Pojem in načrtovanje algoritma.
2. Učinkovitost algoritmov.
3. Osnovni gradniki: dvojiška števila, booleova logika, vrata.
4. Organizacija računalniških sistemov.
5. Uvod v sistemsko programsko opremo in navidezne stroje.
6. Računalniška omrežja, internet, splet.
7. Informacijska varnost.
8. Uvod v visokonivojske programske jezike.
9. Babilonski stolp: več programskih jezikov.
10. Prevajalniki.
11. Modeli računanja.
12. Simulacije in modeliranje.
13. Elektronsko poslovanje in podatkovne baze.
14. Umetna inteligenca.
15. Računalniška grafika in zabavne vsebine: filmi, igre in navidezne skupnosti.
16. Etično odločanje.

Content (Syllabus outline):

The content of the course ranges across different areas of computer science, from the algorithmic foundations, through the hardware and software world to specific applications. The students get acquainted with the basics of the different areas and get introduced to the discipline of computer science as a whole, without going into details in the individual areas.

Course topics follow the chapters of the prescribed book (see below).

1. Algorithm Discovery and Design.
2. The Efficiency of Algorithms.
3. The Building Blocks: Binary Numbers, Boolean Logic, and Gates.
4. Computer Systems Organization.
5. An Introduction to System Software and Virtual Machines.
6. Computer Networks, the Internet, and the World Wide Web.
7. Information Security.
8. Introduction to High-Level Language Programming.
9. The Tower of Babel: Multiple Programming Voices.
10. Compilers and Language Translation.
11. Models of Computation.
12. Simulation and Modelling.
13. Electronic Commerce and Databases.
14. Artificial Intelligence.
15. Computer Graphics and Entertainment: Movies, Games, and Virtual Communities.
16. Making Ethical Decisions.

Temeljni literatura in viri / Readings:

- G. M. Schneider, J. Gersting: *Invitation to Computer Science*, 6th Edition. Course Technology, 2012.

Cilji in kompetence:

Študent pri predmetu dobi širši pregled prek različnih področij računalništva in informatike. Poleg tega, da študent pridobi splošno znanje, je namen predmeta dodatno povečati študentovo zanimanje za računalništvo in mu pomagati pri izboru predmetov, ki jih bo poslušal v drugem in tretjem letniku študija. Študentje bodo osvojili osnovne principe delovanja strojne in programske opreme, omrežij, programskih jezikov in aplikacij.

Študentje bodo razvijali sposobnosti kritičnega in analitičnega razmišljanja, osvojili pa bodo tudi veščine s področja računalništva in informatike, ki so bistvene za to področje in nadaljnji študij na tem področju.

Objectives and competences:

The student is introduced to different areas of computer science. Besides giving this general knowledge, the course is intended to further increase the student's interest in computer science and help him make a more informed decision about the courses in which he is going to enrol in the 2nd and 3rd year of his study. Students will gain a solid background in computing hardware and software, networks, programming languages, and applications.

They will develop skills in critical and analytical thinking, as well as acquire skills in computer and information science that are essential for this field and further study in this area.

Predvideni študijski rezultati:

Poznavanje osnov različnih področij računalništva. Širjenje strokovnih obzorij. Pomoč pri izboru predmetov.

Intended learning outcomes:

Knowledge of different areas of computer science. Expanding professional horizons. Help in selection of courses.

Metode poučevanja in učenja:

Klasična predavanja s sprotno predstavitvijo zgledov. Vaje se izvajajo na računalnikih ali brez njih, ob pomoči učitelja in demonstratorjev, rešitve se oddajajo prek sistema Moodle.

Learning and teaching methods:

Standard lectures using a number of examples. Exercises are done on computers or without them, with a help of teaching assistants, solutions are submitted using Moodle.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kvizi in drugi izdelki)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing work (homeworks, quizzes, and other projects)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail</p> <p>(according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

FIDLER, Sanja, SKOČAJ, Danijel, LEONARDIS, Aleš. Combining reconstructive and discriminative subspace methods for robust classification and regression by subsampling. IEEE trans. pattern anal. mach. intell.. [Print ed.], Mar. 2006, vol. 28, no. 3, str. 337-350, ilustr.

SKOČAJ, Danijel, LEONARDIS, Aleš, BISCHOF, Horst. Weighted and robust learning of subspace representations. Pattern recogn.. [Print ed.], May 2007, vol. 40, no. 5, str. [1556]-1569, ilustr.

SKOČAJ, Danijel, LEONARDIS, Aleš. Incremental and robust learning of subspace representations. Image vis. comput.. [Print ed.], 2008, vol. 26, no. 1, str. 27-38, ilustr.

SKOČAJ, Danijel, KRISTAN, Matej, VREČKO, Alen, LEONARDIS, Aleš, FRITZ, Mario, STARK, Michael, SCHIELE, Bernt, HONGENG, Somboon, WYATT, Jeremy L. Multi-modal learning. V: CHRISTENSEN, Henrik I. (ur.), KRUIJFF, Geert-Jan M. (ur.), WYATT, Jeremy L. (ur.). Cognitive systems, (Cognitive systems monographs, vol. 8). Berlin; Heidelberg: Springer, cop. 2010, str. 265-309, ilustr.

VREČKO, Alen, LEONARDIS, Aleš, SKOČAJ, Danijel. Modelling binding and cross-modal learning in Markov logic networks. Neurocomputing (Amst.). [Print ed.], Nov. 2012, vol. 96, str. 29-36, ilustr.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Računalniška arhitektura

Course title: Computer Architecture

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	1	zimski
Professional study program Computer and Information Science, 1st cycle	none	1	fall

Vrsta predmeta / Course type

obvezni predmet / compulsory course

Univerzitetna koda predmeta / University course code:

63703

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer:

viš. pred. Robert Rozman

Jeziki /

Predavanja / Lectures:

slovenščina
Slovene

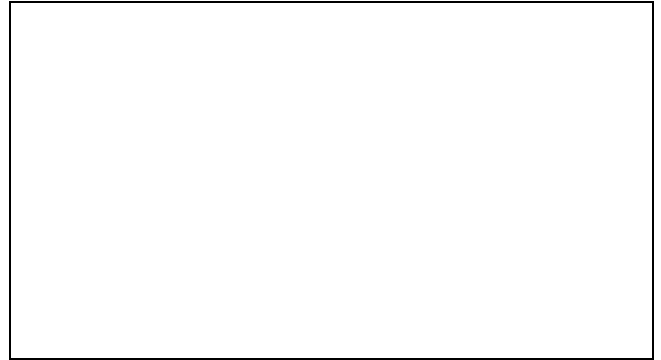
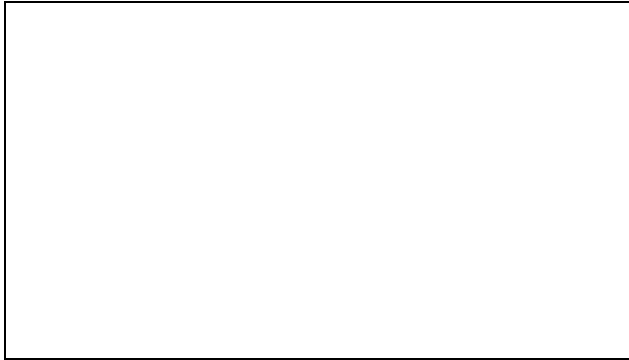
Languages:

Vaje / Tutorial:

slovenščina
Slovene

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

Prerequisites:

**Vsebina:**

- Razvoj računalniških arhitektur
- Von Neumannov računalniški model in osnovni principi delovanja
- Operandi in ukazi, zgradba ukazov, RISC-CISC
- Števila v fiksni in plavajoči vejici, znaki
- Centralna procesna enota
- Pomnilniška hierarhija (glavni pomnilnik, predpomnilniki, navidezni pomnilnik)
- Vhodno izhodni sistem

Content (Syllabus outline):

1. Milestones in computer architecture
2. The von Neumann architecture and basic principles of operation
3. Instructions and instruction set architectures, CISC and RISC
4. Numerical and nonnumerical operands
5. Central processing unit
6. Memory hierarchies
7. Input/Output system

Temeljna literatura in viri / Readings:

1. D. Kodek, Arhitektura in organizacija računalniških sistemov, Bi-Tim, 2008.
2. D. A. Patterson, J. L. Hennessy, Computer Organization and Design, Fifth Edition: The Hardware/Software Interface (The Morgan Kaufmann Series in Computer Architecture and Design), 2013.
3. Prosojnice na vsakoletni učilnici.

Cilji in kompetence:

Podati zgradbo in delovanje današnjih računalnikov z obravnavo za programerja vidnih lastnosti računalnika. Študent naj bi dobil osnovna znanja o zgradbi in delovanju posameznih delov računalniškega sistema in njihovi medsebojni povezavi.

Objectives and competences:

Give structure and operation of a computer from programmer's perspective. Students should get knowledge of basic principles of computer architecture.

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

<p>Znanje in razumevanje:</p> <p>Poznavanje in razumevanje delovanja današnjih računalnikov in različnih računalniških arhitektur.</p> <p>Uporaba:</p> <p>To znanje je pomembno pri čim bolj učinkoviti uporabi današnje računalniške opreme.</p> <p>Refleksija:</p> <p>Izboljšati stanje, da je za večino uporabnikov računalnik črna škatla, dogajanje v računalniku pa nepoznano.</p> <p>Prenosljive spretnosti - niso vezane le na en predmet:</p> <p>Predmet dopolnjuje znanja s področja programiranja, algoritmov in digitalnih vezij.</p>	<p>Knowledge and understanding:</p> <p>Knowledge and understanding of design principles for modern computers and instruction set architectures.</p> <p>Application:</p> <p>Understanding of the possibilities and limitations of what computer technology can and cannot do.</p> <p>Reflection:</p> <p>Improve the condition that majority of users consider computer as a black box.</p> <p>Transferable skills:</p> <p>Complements the knowledge for software engineering and digital logic.</p>
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Metode poučevanja in učenja:

Learning and teaching methods:

<p>Predavanja in laboratorijske vaje. Poudarek na laboratorijskem delu na simulatorju preproste cevovodne CPE in mikroprocesorskem sistemu na osnovi Atmelovega 32-bitnega mikrokontrolnika.</p>	<p>Lectures and laboratory exercises. Lab work on pipelined CPE simulator and ARM based microprocessor system.</p>
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, midterm exams, project work)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail</p> <p>(according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

- Programska in aparaturna oprema za krmiljenje prometnih signalov semaforiziranega križišča. Ljubljana Iskra Avtomatika 1977-1979 (D.Kodek, B.Vilfan, T.Mohorič, I.Škraba)
- Programska oprema za krmiljenje in uporabo V/I enot pri Najavnem centru v MTC Moskva. Ljubljana, Iskra ATC, 1979-1983.
- Razvoj in izdelava sistema za razpoznavanje izoliranih besed slovenskega govora. Ljubljana PTT-Ljubljana, 1992-1994 (D.Kodek, D.Hvala, B.Petek, I.Škraba, D.Šonc)
- KODEK, Dušan, ŠKRABA, Igor. *Računalniške komunikacije*, (Računalniški komunikacijski sistemi in mreže). Ljubljana: RSS, 1985. 25 str. [COBISS-ID 11025664]
- ŠKRABA, Igor, KODEK, Dušan. Preverjanje kakovosti programske opreme. V: ZAJC, Baldomir (ur.). *Zbornik druge Elektrotehniške in računalniške konference ERK '93, september 1993, Portorož, Slovenija*. Ljubljana: IEEE Region 8, Slovenska sekcija IEEE, 1997, zv. B, str. 115-117. [COBISS-ID 802388]

Celotna bibliografija je dostopna na SICRISu: <http://sicris.izum.si/search/rsr.aspx?lang=slv&id=4928>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Matematika
Course title:	Mathematics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika Interdisciplinarni univerzitetni študijski program Upravna informatika prve stopnje	ni smeri	1	zimski
Professional study program Computer and Information Science, 1st cycle Interdisciplinary university study programme in Administrative Informatics 1 st cycle	none	1	fall

Vrsta predmeta / Course type

obvezni predmet / compulsory course izbirni predmet / elective course
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Univerzitetna koda predmeta / University course code:

63704

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer:

izr. prof. dr. Polona Oblak

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

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

Prerequisites:

Vsebina:

<p>Predavanja:</p> <ul style="list-style-type: none"> • števila: realna in kompleksna števila • vektorji: vektorji v ravnini in prostoru; • matrike, sistemi linearnih enačb • zaporedja: eksplicitna in rekurzivna zaporedja, limita; • realne funkcije: graf, kompozitum, inverzna funkcija, pregled elementarnih funkcij, zveznost; • odvod: definicija odvoda, odvodi elementarnih funkcij, pravila za odvajanje, uporaba odvoda; • integral: nedoločeni in določeni integral, zveza med njima, pravila za računanje integralov, uporaba integrala; <p>Vaje:</p> <p>Vaje so deloma avditorne in so namenjene skupinskemu utrjevanju obravnavane snovi z računskimi primeri s pomočjo asistenta. Delno vaje potekajo laboratorijsko, s samostojnim delom študentov z računalnikom. Pri laboratorijskih vajah se uporablja programska oprema za simbolično računanje (Mathematica, npr.).</p> <p>Domače naloge:</p> <p>Domače naloge so predvidene v tedenskem ritmu in obvezne. Namen domačih nalog je pripraviti</p>

Content (Syllabus outline):

<p>Lectures:</p> <ul style="list-style-type: none"> • Numbers: real and complex numbers • Vectors: vectors in real plane and in space; • Matrices, systems of linear equations. • Sequences: explicit and recursive sequence, limit; • Functions: graph, composite, inverse function, elementary functions, continuity; • Derivatives: definition, derivatives of elementary functions, rules of derivation, use of derivatives; • Integrals: indefinite and definite integrals, techniques of integration, evaluation of definite integrals, use of integrals; <p>Exercise groups:</p> <p>Exercise group time is in part devoted to the classical blackboard approach, the students solve computational problems with some help of TA. In part of the exercise groups the students individually solve computerized versions of problems using symbolic computation software.</p> <p>Homework:</p> <p>A short homework is assigned every week and is compulsory. The purpose of the homework is to</p>

študenta k sprotnemu študiju predmeta. Vsebine domačih nalog praviloma sledijo temam iz kontaktnih ur.

promote ongoing study and help students to understand the ideas and concepts of the course.

Temeljni literatura in viri / Readings:

- Polona Oblak: Matematika, Ljubljana, 2014, <http://matematika.fri.uni-lj.si/mat/matvsp.pdf>.
- Gabrijel Tomšič, Bojan Orel, Neža Mramor: Matematika I; Ljubljana, Fakulteta za elektrotehniko in računalništvo.
- James Stewart: Calculus: early transcendentals (5th edition), Brooks/Cole - Thomson, cop. 2003.
- Neža Mramor Kosta, Borut Jurčič Zlobec: Zbirka nalog iz matematike I; Ljubljana, Fakulteta za elektrotehniko in računalništvo.
- R. Beezer: A First Course in Linear Algebra, <http://linear.ups.edu>.

Cilji in kompetence:

Zmožnost kritičnega razmišljanja.

Razvoj veščin kritičnega, analitičnega in sintetičnega razmišljanja.

Cilj predmeta je utrditi poznavanje in razumevanje osnovnih pojmov linearne algebre in matematične analize kot so konvergenca, funkcije, odvod, integral, vektorji in matrike ter prikazati njihove osnovne lastnosti in pa njihovo uporabo pri reševanju problemov v računalništvu in nasploh v znanostih.

Objectives and competences:

Ability of critical thinking.

Developing skills in critical, analytical and synthetic thinking.

A major part of the course is devoted to the understanding of the basic terms of mathematical analysis and linear algebra (i.e. convergence, functions, derivation, integration, vectors, matrices) and their application in computer science and other sciences.

Predvideni študijski rezultati:

Znanje in razumevanje:

Po uspešnem zaključku tega predmeta bo študent sposoben uporabljati osnovne pojme linearne algebre in matematične analize ter razumeti matematične formule in modele, ki na njih temeljijo.

Uporaba:

Sposobnost uporabe osnovnih metod linearne algebre in matematične analize pri reševanju problemov iz različnih področjih ter pri načrtovanju

Intended learning outcomes:

Knowledge and understanding:

Students should be able to demonstrate general knowledge of the basic linear algebra and mathematical analysis, and to understand mathematical formulas and models.

Application:

Use of the basic methods of linear algebra and mathematical analysis in various disciplines of computer science.

in analizi računalniških algoritmov, postopkov in programov.

Refleksija:

Spoznavanje matematičnega jezika za konsistentno in natančno opisovanje pojavov in razumevanje odnosa med teoretičnim modelom in njegovo implementacijo na različnih področjih računalništva.

Prenosljive spretnosti - niso vezane le na en predmet:

Uporaba abstraktnih sistemov za reševanje konkretnih problemov, identifikacija in reševanje problemov.

Reflection:

Learning mathematical language and rigor to understand and accurately describe phenomena, understanding the relationship between the theoretical model and its implementation in various areas of computer science.

Transferable skills:

Use of the abstraction to enable students to solve problems that may come up in their field of specialization.

Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja, vaje z ustnimi nastopi in delom z računalniki, domače naloge. Poseben poudarek je na sprotnem študiju z domačimi nalogami in na samostojnem delu z računalnikom in uporabo programske opreme.

Lectures, exercise groups, homework assignments. The focus lies in continuous work with home assignments, using computer and computation software.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, midterm exams, project work)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail</p> <p>(according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

- OBLAK, Polona. The upper bound for the index of nilpotency for a matrix commuting with a given nilpotent matrix. Linear multilinear algebra, 2008, vol. 56, no. 6, str. 701-711.

- DOLŽAN, David, OBLAK, Polona. Invertible and nilpotent matrices over antirings. *Linear algebra appl.*, 2009, vol. 430, iss. 1, str. 271-278.
- KOŠIR, Tomaž, OBLAK, Polona. On pairs of commuting nilpotent matrices. *Transform. groups*, 2009, vol. 14, no. 1, str. 175-182.
- DOLINAR, Gregor, GUTERMAN, Aleksandr Ėmilevič, KUZMA, Bojan, OBLAK, Polona. Extremal matrix centralizers. *Linear Algebra and its Applications*, 2013, vol. 438, iss. 7, str. 2904-2910.
- OBLAK, Polona, ŠMIGOC, Helena. Graphs that allow all the eigenvalue multiplicities to be even. *Linear Algebra and its Applications*, 2014, vol. 454, str. 72-90.

Celotna bibliografija je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=15808>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Podatkovne baze

Course title: Databases

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika Interdisciplinarni univerzitetni študijski program Upravna informatika prve stopnje	ni smeri	1	poletni
Professional study program Computer and Information Science, 1st cycle Interdisciplinary university study programme in Administrative Informatics 1 st cycle	none	1	spring

Vrsta predmeta / Course type

obvezni predmet / compulsory course

Univerzitetna koda predmeta / University course code:

63707

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer:

izr. prof. dr. Matjaž Kukar

Jeziki /

Predavanja / Lectures:

slovenščina
Slovene

Languages:

Vaje / Tutorial: slovenščina
Slovene

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

Prerequisites:

Vsebina:

Content (Syllabus outline):

Predavanja obsegajo naslednje tematske vsebine:

1. Uvodni del, ki predstavi motivacijo za delo s podatkovnimi bazami in predstavi osnovne pojme: podatkovna baza, podatkovna neodvisnost, podatkovne baze in datotečni sistem.
2. Pregled programske opreme, ki omogoča delo s podatkovnimi bazami s poudarkom na sistemih za upravljanje podatkovnih baz (SUPB) in njihovo zgradbo, funkcijami in nalogami.
3. Predstavitev splošnega pogleda na arhitekturo podatkovne baze, obravnava uporabniških pogledov in podatkovne neodvisnosti
4. Osnove administracije podatkovnih baz: uporabniške vloge in privilegiji, logični in fizični prostor, dnevniki, načini delovanja podatkovne baze.
5. Obravnava različnih podatkovnih modelov, ki služijo kot teoretična osnova za shranjevanje podatkov in operacijami nad njimi: mrežni, hierarhični, relacijski, objektni in objektno-relacijski model.
6. Podrobna obravnava relacijskega podatkovnega modela. Pregled osnovnih gradnikov (relacije, atributi, ključi), in operacij nad njimi (relacijska algebra in relacijski račun).
7. Implementacija relacijskega podatkovnega modela v relacijskih SUPB. Razširitve

Course topics:

1. Introduction and motivation for database use and explanation of basic concepts: database, data independence, comparisons of databases and file system data storage.
2. Overview of software programs that support the usage of database, focusing on database management systems (DBMS), their functions and tasks they can perform.
3. Overview of generalized database architecture, thorough explanation of data independence and user views.
4. Basic concepts of database management: user roles and privileges, logical and physical space, logging and modes of DBMS execution.
5. Introduction to different data models that serve as a theoretical foundation for data storage and operation: network and hierarchical model, relational, object and object-relational model.
6. Thorough discussion of the relational data model. Overview of its basic building blocks (relations, attributes, keys) and operations (relational algebra and calculus).
7. Implementation of relational data model in relational DBMS and its practical extensions. Query languages SQL and QBE.
8. Estimation of query complexity and its optimization. Usage of indexes and triggers.

<p>relacijskega modela v praksi. Povpraševalna jezika SQL in QBE.</p> <ol style="list-style-type: none"> 8. Ocenjevanje hitrosti izvajanja operacij nad podatkovno bazo. Možnosti za pospeševanje izvajanja. Uporaba indeksov in baznih prožilcev. 9. Osnova načrtovanja podatkovnih baz. Opis problemov, ki nastanejo pri slabem načrtovanju podatkovnih baz in motivacija za uporabo normaliziranih oblik relacij. 10. Nadzor nad sočasno uporabo podatkovne baze. Upravljanje s transakcijami kot nedeljivimi gradniki programov za delo s podatkovno bazo. 11. Različni načini dostopa do podatkovne baze: vrste klientov, programski dostop. Vloga podatkovnih baz v spletnih aplikacijah. <p>Vaje:</p> <ol style="list-style-type: none"> 1. Seznaniti se s konkretnim SUPB in načini dostopa do podatkovne baze, ki nam jih omogoča. 2. Temeljito spoznati povpraševalni jezik SQL in njegovo praktično uporabo. 3. Izkazati pridobljena znanja v praktičnih primerih (v obliki domačih nalog). Rezultate domačih nalog študenti predstavijo v obliki seminarjev. 	<ol style="list-style-type: none"> 9. Basic concepts of database design. Normal forms and benefits of their use. 10. Concurrent database use and transactions. 11. Different ways of accessing the data in databases. Various client types, programmatic access. The role of databases in Web applications. <p>Tutorial topics:</p> <ol style="list-style-type: none"> 1. Getting familiar with a chosen DBMS and provided data access options. 2. Learning to use the query language SQL thoroughly, both in theory and in practice. 3. Using the obtained knowledge for practical database problem solving (homework and a non-trivial project). <p>Through tutorial students get familiar with the chosen DMBS and the tools it provides, and use them - in course of their project – as a part of a practical problem solution. The final part of the project is a written presentation of the assigned problem, its solution and results.</p>
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Temeljni literatura in viri / Readings:

<ol style="list-style-type: none"> 1. T. M. Connolly, C. E. Begg: Database Systems: A Practical Approach to Design, Implementation and Management, 4. izdaja, Addison Wesley, 2004. 2. S. Sumathi, S. Esakkirajan: Fundamentals of Relational Database Management Systems, Springer, 2007. 3. R. Ramakrishnan, J. Gehrke: Database Management Systems, 3. izdaja, McGraw-Hill, 2002.

Cilji in kompetence:

Objectives and competences:

Cilj predmeta je študentom računalništva in informatike predstaviti osnovne principe delovanja sistemov za upravljanje s podatkovnimi bazami (SUPB), jih seznaniti z načini uporabe podatkovnih baz in jih pripraviti na samostojno in suvereno uporabo orodij, predvsem povpraševalnega jezika SQL.

Splošne kompetence:

- sposobnost kritičnega mišljenja
- razvoj sposobnosti kritičnega, analitičnega in sintetičnega mišljenja
- sposobnost definiranja, razumevanja in reševanja strokovnih izzivov na področju računalništva in informatike
- Skladnost z varnostnimi, funkcionalnimi, ekonomskimi in okoljskimi vodili.
- sposobnost samostojne uporabe pridobljenega znanja pri reševanju tehničnih in znanstvenih izzivov na področju računalništva in informatike; sposobnost nadgradnje pridobljenega znanja

Predmetno specifične kompetence:

- temeljna znanja na področju računalništva in informatike, ki vključujejo temeljna teoretična znanja, praktična znanja in znanja, ki so bistvena za področje računalništva in informatike,
- praktična znanja in veščine na področju strojne opreme, programske opreme in informacijskih tehnologij, ki so nujna za uspešno delo na področju računalništva in informatike
- sposobnost samostojne izvedbe manj zahtevnih in zahtevnih inženirskih in organizacijskih opravil na določenih ozkih področjih in neodvisnega reševanja določenih dobro opredeljenih opravil na področju računalništva in informatike

The main course objective is to introduce the students to principles of database management systems and their various usages, and prepare them for autonomous and efficient use of available tools, especially SQL.

General competences:

- ability of critical thinking
- developing skills in critical, analytical and synthetic thinking
- the ability to define, understand and solve creative professional challenges in computer and information science;
- compliance with security, functional, economic and environmental principles
- the ability to apply acquired knowledge in independent work for solving technical and scientific problems in computer and information science; the ability to upgrade acquired knowledge

Subject specific competences:

- basic skills in computer and information science, which includes basic theoretical skills, practical knowledge and skills essential for the field of computer and information science.
- practical knowledge and skills of computer hardware, software and information technology necessary for successful professional work in computer and information science
- the ability to independently perform both less demanding and complex engineering and organisational tasks in certain narrow areas and independently solve specific well-defined tasks in computer and information science

Predvideni študijski rezultati:

Znanje in razumevanje:

Poznavanje področja podatkovnih baz, ter razumevanje principov in pristopov za delo z njim.

Intended learning outcomes:

Knowledge and understanding:

Comprehensive knowledge of databases and database management systems, underlying principles, and their exploitation.

<p>Uporaba:</p> <p>Uporaba orodij za delo s podatkovnimi bazami in dela s povpraševalnim jezikom SQL.</p> <p>Refleksija:</p> <p>Spoznavanje in razumevanje povezav med teoretičnimi principi relacijskega podatkovnega modela in njihovo praktično uporabo v podatkovnih bazah.</p> <p>Prenosljive spretnosti - niso vezane le na en predmet:</p> <p>Hranjenje podatkov v podatkovnih bazah in delo z njimi sta osnovni prenosljivi spretnosti, ki se uporabljata na praktično vseh področjih računalništva.</p>	<p>Application:</p> <p>Efficient use of various database tools and query language SQL.</p> <p>Reflection:</p> <p>Introduction and comprehension of interactions between theoretical principles (especially those of relational data model) and their practical use in modern databases.</p> <p>Transferable skills:</p> <p>Data storage in databases and their use are basic transferrable skills, useful in virtually all fields of computer science.</p>
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Metode poučevanja in učenja:

Learning and teaching methods:

<p>Predavanja in seminarski način dela pri domačih nalogah. Poseben poudarek je na sprotne študiju in na individualnem delu pri domačih nalogah in seminarjih.</p>	<p>Lectures, homework and project work with explicit focus on simultaneous studies (for homework) and teamwork (for projects).</p>
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>60%</p> <p>40%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, midterm exams, project work)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail</p> <p>(according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

1. KONONENKO, Igor, KUKAR, Matjaž. Machine learning and data mining: introduction to principles and algorithms. Chichester: Horwood Publishing, 2007.
2. PETELIN, Boris, KONONENKO, Igor, MALAČIČ, Vlado, KUKAR, Matjaž. Multi-level association rules and directed graphs for spatial data analysis. Expert syst. appl. [Print ed.], 2013, vol. 40, issue 12, 4957-4970.
3. KUKAR, Matjaž, KONONENKO, Igor, GROŠELJ, Ciril. Modern parameterization and explanation techniques in diagnostic decision support system: a case study in diagnostics of coronary artery disease. Artif. intell. med., Jun. 2011, vol. 52, no. 2, 77-90.
4. ŠAJN, Luka, KUKAR, Matjaž. Image processing and machine learning for fully automated probabilistic evaluation of medical images. Computer methods and programs in biomedicine, ISSN 0169-2607. [Print ed.], Dec. 2011, vol. 104, no. 3, 75-86,
5. KUKAR, Matjaž. Quality assessment of individual classifications in machine learning and data mining. Knowledge and information systems, 2006, vol. 9, no. 3.

Celotna bibliografija doc. dr. Kukarja je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=8453>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Operacijski sistemi

Course title: Operating Systems

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	1	poletni
Professional study program Computer and Information Science, 1st cycle	none	1	spring

Vrsta predmeta / Course type

obvezni predmet / compulsory course

Univerzitetna koda predmeta / University course code:

63709

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer:

izr. prof. dr. Peter Peer

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

slovenščina
Slovene

slovenščina
Slovene

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

Prerequisites:

Ker je to predmet začetka študija, posebnih pogojev ni.

Since the course is given at the beginning of the study, it has no prerequisites.

Vsebina:

Predavanja:

Uvodne besede

Sklop: Ozadje

1. Predstavitev računalniškega sistema
2. Predstavitev operacijskega sistema

Sklop: Procesi

3. O procesih in nadzoru
4. Nitke
5. Sočasnost: vzajemno izključevanje, sinhronizacija, smrtni objem in stradanje

Sklop: Pomnilnik

6. Upravljanje s pomnilnikom
7. Navidezni pomnilnik

Sklop: Razporejanje

8. Enoprocesorsko razporejanje
9. Večprocesorsko razporejanje in razporejanje v realnem času

Sklop: Vhod/izhod, datoteke

10. Upravljanje V/I in dettalneje diska
11. Upravljanje z datotekami

Vaje:

Pri vajah utrjujemo in bolj podrobno obdelamo izbrane teme s predavanj. Usvojene koncepte bomo spoznavali znotraj OS Linux ter

Content (Syllabus outline):

Lectures:

Introduction

Background

1. Computer systems overview
2. Operating systems overview

Processes

3. Process description and control
4. Threads
5. Concurrency: mutual exclusion, synchronization, deadlock, and starvation

Memory

6. Memory management
7. Virtual memory

Scheduling

8. Uniprocessor scheduling
9. Multiprocessor and real-time scheduling

Input/output and files

10. I/O management and disk scheduling
11. File management

Tutorials:

Selected topics from the lectures will be further discussed. Presented concepts will be practically demonstrated in OS Linux and Bash scripting language. A student will have to work on a

skriptnega jezika Bash. Potrebno bo rešiti kopico nalog na vajah in domačih nalog.

number of tutorial assignments and homeworks.

Temeljna literatura in viri / Readings:

- William Stallings, Jurij Mihelič, Bojan Klemenc, Peter Peer, *Koncepti operacijskih sistemov z Linuxovo lupino in programiranjem v Bashu (Operating systems concepts with Linux shell and Bash programming)*, Pearson, 2013. (glavna, izhodiščna literatura/primary literature)
- Avi Silberschatz, Peter Baer Galvin, Greg Gagne, *Operating System Concepts with Java*, 8. izdaja/edition, John Wiley & Sons, 2010.
- Andrew S. Tanenbaum, Albert S. Woodhull, *The MINIX book – Operating Systems: Design and Implementation*, 3. izdaja/edition, Pearson, 2009.

Cilji in kompetence:

Osnovni cilj predmeta je spoznati namen operacijskega sistema v vsakem računalniškem sistemu, njegovo vpetost med strojno in uporabniško programsko opremo. Študentje razumejo delovanje posameznih segmentov operacijskega sistema, ki v osnovi implementirajo koncept procesa, upravljanja s pomnilnikom, razporejanja in upravljanja V/I, tudi s praktičnega vidika.

Splošne kompetence:

- Razvoj veščin za kritično, analitično in sintetično razmišljanje.
- Zmožnost razumeti in rešiti strokovne izzive na področju računalništva in informatike.
- Zmožnost apliciranja pridobljenega znanja pri samostojnem delu, ki vključuje reševanje tehničnih problemov na področju računalništva in informatike; zmožnost nadgrajevanja pridobljenega znanja.

Predmetno specifične kompetence:

- Osnovne veščine na področju računalništva in informatike, ki vključujejo osnovne teoretične

Objectives and competences:

The main objective of the course is to understand the purpose of the OS in the computer system, its connection to HW and user SW. Students understand the concepts behind each OS part, which implement the concept of process, memory management, scheduling and I/O management, also from the practical point of view.

General competences:

- Developing skills in critical, analytical and synthetic thinking.
- The ability to understand and solve professional challenges in computer and information science.
- The ability to apply acquired knowledge in independent work for solving technical problems in computer and information science; the ability to upgrade acquired knowledge.

Subject specific competences:

- Basic skills in computer and information science, which includes basic theoretical skills, practical

veščine, praktično znanje in veščine ključne na področju računalništva in informatike.

knowledge and skills essential for the field of computer and information science.

Predvideni študijski rezultati:

Znanje in razumevanje:

Poleg deklarativnega znanja o strukturi in delovanju operacijskih sistemov, je poudarek na razumevanju osnovnih segmentov s praktičnega vidika.

Uporaba:

Poznavanje arhitekture operacijskega sistema ter s tem možnosti vklapljanja razširitev, spreminjanja. Zmožnost ocene primernosti posameznih postopkov v kontekstu specifičnih realnih problemov.

Refleksija:

Študent pozna gradnike operacijskega sistema ter povezanost le-teh med seboj ter navzven s strojno in uporabniško programsko opremo. Uvidi uglasenost med teoretično razlago in praktično aplikacijo.

Prenosljive spretnosti - niso vezane le na en

predmet:

Operacijski sistemi so osnovna programska oprema vsakega računalniškega sistema. S poznavanjem osnovnih konceptov postavimo dobre temelje za nadgraditev uporabnosti celostnega računalniškega sistema.

Intended learning outcomes:

Knowledge and understanding:

Beside declarative knowledge about structure and execution of OS, the focus is on understanding basic parts from the practical point of view.

Application:

Knowing the architecture of OS, possibility of changing it, adding upgrades. Evaluation of different algorithms in the context of specific real problems.

Reflection:

Student knows parts of the OS, relations between them, and connections with HW and user SW. Student realizes the harmony between the theoretical explanation and practical application.

Transferable skills:

OS is a foundational SW of each computer system. By understanding basic concepts we build strong foundations for upgrade of functionality of the computer system.

Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja podajajo osnovne zakonitosti, vaje jih vpeljujejo v prakso. Vaje imajo laboratorijski značaj. V operacijskem sistemu se rešujejo krajše naloge, katerih cilj je preverjanje teoretično predstavljenih postopkov v praksi. Poudarek je na sprotne študiju.

Lectures give basic concepts, tutorial further enlighten their practical value. Tutorials have laboratory sessions characteristic. In OS shorter assignments are carried out, their main goal being connecting theory with practice. Emphasis is put on continuous assessment.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje znanja (naloge na vajah, domače naloge)</p> <p>Končno preverjanje (pisni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuous assessment (exercices at laboratory sessions, homeworks)</p> <p>Final examination (written exam)</p> <p>Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del / Five selected publications:

- PEER, Peter, EMERŠIČ, Žiga, BULE, Jernej, ŽGANEC GROS, Jerneja, ŠTRUC, Vitomir. Strategies for exploiting independent cloud implementations of biometric experts in multibiometric scenarios. *Mathematical problems in engineering*, ISSN 1024-123X. [Print ed.], 13 Mar. 2014, vol. 2014, str. 1-15.
- KOVAČ, Jure, PEER, Peter. Transformation based walking speed normalization for gait recognition. *Transactions on internet and information systems*, ISSN 1976-7277, Nov. 2013, vol. 7, no. 11, str. 2690-2701.
- P. Peer, F. Solina, Where physically is the optical center?, *Pattern Recognition Letters* 27(10), pp. 1117-1121, 2006.
- L. G. Corzo, J. A. Penaranda, P. Peer, Estimation of a fluorescent lamp spectral distribution for color image in machine vision, *Machine Vision and Application* 16(5), pp. 306-311, 2005.
- P. Peer, F. Solina, Panoramic Depth Imaging: Single Standard Camera Approach, *International Journal of Computer Vision* 47(1/2/3), pp. 149-160, 2002.

Celotna bibliografija je dostopna na COBISSu / Whole bibliography is available in COBISS:
<http://splet02.izum.si/cobiss/bibliography?langbib=eng&li=en&homelang=svn&code=19226>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Algoritmi in podatkovne strukture 1
Course title:	Algorithms and Data Structures 1

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	zimski
Professional study program Computer and Information Science, 1st cycle	none	2	fall

Vrsta predmeta / Course type obvezni predmet / compulsory course

Univerzitetna koda predmeta / University course code: 63711

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer: doc. dr. Jurij Mihelič

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

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

Diskretne strukture. Analiza I. Programiranje I in II.

Discrete structures. Calculus I. Programming I and II.

Vsebina:

1. Osnove algoritmov: pojem algoritma, problema, naloge in rešitve, vrste problemov, opis algoritma, sled algoritma, metode razvoja, pravilnost algoritmov
2. Računska zahtevnost algoritmov: računski viri, model računanja, RAM, natančna zahtevnost, asimptotična notacija O , Ω , Θ , limite, razredi zahtevnosti
3. Osnove podatkovnih struktur: abstraktni podatkovni tip (ADT), množica, vreča, sklad, vrsta, vrsta z dvojnimi konci, prioritarna vrsta, slovar, polje kot ADT, povezani seznam kot ADT, implicitne in eksplicitne strukture
4. Drevesa: ukoreninjeno drevo, dvojiška in k -tiška drevesa, obhodi dreves, predstavitev dreves (implicitna, kazalci), kopica
5. Urejanje tabel: urejanje z izbiranjem, z vstavljanjem in z mehurčki, urejanje s kopico in z zlivanjem, hitro urejanje, urejanje s koši in s preštevanjem, korenasto urejanje
6. Statistike reda: k -ti najmanjši element, hkratno iskanje minimuma in maksimuma, hitra izbira, mediana median
7. Metode snovanja algoritmov: pregled, groba sila, par najbližjih točk, iskanje podniza, izčrpno preiskovanje, generiranje permutacij in kombinacij
8. Preiskovanje drevesa stanj: sestopanje, razveji in omeji, labirint, skakačev obhod, kraljice na šahovnici, optimizacijski problemi, 0/1 nahrbtnik, rezanje drevesa
9. Metoda deli in vladaj: analiza rekurzivnih algoritmov in rekurence, mojstrov izrek, par najbližjih točk
10. Požrešna metoda: menjava kovancev, razporeditev datotek na trak, razvrščanje zapisov in poslov, Huffmanovo kodiranje, navadni nahrbtnik, k -center problem

Content (Syllabus outline):

1. Basics of algorithms: notion of algorithm, problem, instance and solution, problem kinds, algorithm description, algorithm trace, design methods, correctness of algorithms
2. Computational complexity of algorithms: computational resources, models of computation, RAM, asymptotic notation O , Ω , Θ , limits, complexity classes
3. Basics of data structures: abstract data type (ADT), set, bag, stack, queue, double-ended queue, priority queue, dictionary, array for implementing ADTs, linked list for implementing ADTs, implicit and explicit data structures
4. Trees: rooted tree, binary and k -ary trees, tree traversals, tree representations (implicit, pointers), heap
5. Array sorting: selection sort, insertion sort, bubble sort, heapsort, mergesort, quicksort, bucket sort, counting sort, radix sort
6. Order statistic: k -th smallest element, finding minimum and maximum at the same time, quickselect, median of medians
7. Algorithm design techniques: overview, brute force, closest pair of points, substring search, exhaustive search, generating permutations and combinations
8. Search tree: backtracking, branch and bound, maze, knights tour, optimization problems, 0/1 knapsack, pruning search tree
9. Divide and conquer technique: analysis of recursive algorithms and recurrence equations, master theorem, closest pair of points
10. Greedy method: exchanging coins, arranging files to track, scheduling records and tasks, Huffman coding, standard knapsack, k -center problem
11. Basics of graphs: graph representation with adjacency lists, adjacency matrix, incidence

11. Osnove grafov: predstavitev grafa, seznam in matrika sosednosti, incidenčna matrika, algebraični algoritmi, iskanje v širino in v globino, dosegljivost, topološko urejanje in cikli, povezanost grafov, krepko povezane komponente
12. Aritmetični algoritmi: mala in velika števila, aritmetične operacije, modularna aritmetika, množenje velikih celih števil s Karacubovim algoritmom, množenje matrik s Strassenovim algoritmom, največji skupni delitelj
13. Izbrane teme

- matrix, depth-first search, breadth-first search, reachability, topological sorting of vertices and cycles, connectivity, strongly connected components
12. Arithmetic algorithms: small and big numbers, arithmetic operations, modular arithmetic, multiplication of big integers with Karatsuba's algorithm, matrix multiplication with Strassen's algorithm, greatest common divisor
 13. Selected topics

Temeljni literatura in viri / Readings:

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest in Clifford Stein, Introduction to Algorithms. McGraw-Hill, 2001.
- S. Dasgupta, C. H. Papadimitriou, U. V. Vazirani, Algorithms, McGraw-Hill, 2007.
- Robert Sedgewick: Algorithms in Java, Parts 1-4, Addison-Wesley, 2003.

Dodatno literaturo v obliki člankov in posnetkov predavanj znanih predavateljev dobijo preko spletne učilnice.

Cilji in kompetence:

Za reševanje računskih oz. algoritmičnih problemov se študent spozna z izbiro primerne algoritma in podatkovne strukture. Poleg tega se seznanja z osnovami snovanja algoritmov in podatkovnih struktur, preverjanja njihove pravilnosti ter analize in vrednotenja njihove kakovosti.

Predvidene kompetence:

- abstraktno in analitično mišljenje,
- poznavanje terminologije iz algoritmov in podatkovnih struktur,
- zmožnost definiranja in formalizacije problema,
- poznavanje izbranih algoritmov
- poznavanje izbranih podatkovnih struktur
- poznavanje izbranih metod snovanja algoritmov
- algoritmično reševanje problemov,
- vrednotenje kakovosti rešitve,
- analiza pravilnost algoritma,
- ocenjevanje zahtevnosti algoritmov,
- implementacija izbranih algoritmov.

Objectives and competences:

Student learns to choose suitable algorithm and data structure for solving computational and algorithmic problems. Additionally, student learns basics of algorithms and data-structures design, checking their correctness, and analyzing their quality.

Competences:

- abstract and analytical thinking,
- use of algorithms and data structures terminology,
- capability to define and formalize the problem,
- knowledge of selected algorithms,
- knowledge of selected data structures,
- knowledge of selected algorithm design methods,
- solving problems algorithmically,
- evaluation of the solution quality,
- checking correctness of algorithms,
- estimation of algorithm complexity,
- implementation of selected algorithms.

Predvideni študijski rezultati:

Študent spozna osnovne metode za snovanje, analizo in vrednotenje kakovosti algoritmov in podatkovnih struktur. Zna razčlenjevati probleme in rešitve nato združevati v skupno rešitev ter ovrednotiti njihovo kakovost.

Intended learning outcomes:

Student learns basic knowledge of methods for quality evaluation of algorithms and data structures. (S)he learns how to analyze problems and then combine solutions into a general solution, and evaluate their quality.

Metode poučevanja in učenja:

Predavanja s pomočjo prosojnic in table. Vaje deloma avditorne, deloma laboratorijske in konzultacijske. Reševanje teoretičnih in praktičnih kvizov, izzivov (krajše naloge), domačih nalog in seminarjev.

Learning and teaching methods:

Lectures using slides and blackboard. Exercises are partly conducted by examples and explanation, partly as laboratory work and consultations. Solving theoretical and practical quizzes, challenges (short assignments), homework assignments and seminars.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Sprotno preverjanje: kvizi, izzivi, domače naloge, seminarji, kolokviji.	50 %	Continuing examination: quizzes, challenges, homework assignments, seminars, and midterm exams.
Končno preverjanje: pisni izpit in ustni izpit po potrebi.	50 %	Final examination: written exam and oral exam if needed.
Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).		Grading: 6-10 pass, 1-5 fail (according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

1. MIHELIČ, Jurij, ROBIČ, Borut. Flexible-attribute problems. *Computational optimization and applications*, 2010, vol. 47, no. 3, str. 553-566.
2. MIHELIČ, Jurij, MAHJOUR, Amine, RAPINE, Christophe, ROBIČ, Borut. Two-stage flexible-choice problems under uncertainty. *European journal of operational research*, 2010, vol. 201, no. 2, str. 399-403.
3. MIHELIČ, Jurij, DOBRAVEC, Tomaž. SicSim: a simulator of the educational SIC/XE computer for a system-software course. *Computer applications in engineering education*, 2013, str. 1-10.
4. ČIBEJ, Uroš, MIHELIČ, Jurij. Improvements to Ullmann's algorithm for the subgraph isomorphism problem. *International journal of pattern recognition and artificial intelligence*, 2015, vol. 29, no. 7, str. 1-26.
5. MIHELIČ, Jurij, ROBIČ, Borut. Solving the k-center problem efficiently with a dominating set algorithm. *Journal of Computing and Information Technology*, 2005, vol. 13, no. 3, str. 225-233.

Celotna bibliografija doc. dr. Miheliča je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=15487>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Tehnologija programske opreme

Course title: Software Engineering

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika Interdisciplinarni univerzitetni študijski program Upravna informatika prve stopnje	ni smeri	3	zimski
Professional study program Computer and Information Science, 1st cycle Interdisciplinary university study programme in Administrative Informatics 1 st cycle	none	3	fall

Vrsta predmeta / Course type

obvezni predmet / compulsory course
izbirni predmet / elective course

Univerzitetna koda predmeta / University course code:

63732

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	20	10	/	/	105	6

Nosilec predmeta / Lecturer:

viš. pred. dr. Igor Rožanc

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

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

Prerequisites:

Vsebina:

Predavanja obsegajo naslednja poglavja:

1. Uvod v Tehnologijo programske opreme; motivacija
2. Modeli razvoja programske opreme
3. Agilne metodologije, Scrum, XP
4. Načrtovanje projektov (projektni načrt, vključno s terminskim načrtom, oceno obsega dela in stroškov ter obvladovanjem tveganj)
5. Življenjski cikel razvoja programske opreme
6. Zajem in upravljanje zahtev
7. UML (pregled)
8. Arhitektura sistema
9. Načrtovanje modulov
10. Načrtovalski vzorci
11. Implementacija, dokumentiranje
12. Testiranje in testno voden razvoj
13. Vzdrževanje programske opreme
14. Evalvacija projekta, procesov in izdelkov
15. Pogled v prihodnost tehnologije programske opreme

Vaje:

Na laboratorijskih vajah študentje utrjujejo obravnavano snov na postopnem razvoju manjše aplikacije, ki jo izvedejo kot samostojno delo na

Content (Syllabus outline):

Lectures cover the following chapters:

1. Introduction to Software Engineering; motivation
2. Software development models
3. Agile methodologies, Scrum, XP
4. Project planning (project plan, including project schedule, work/budget estimations and risk management)
5. Software development life cycle
6. Capturing and managing the requirements
7. UML (overview)
8. System architecture
9. Designing the modules
10. Design patterns
11. Implementation, documentation
12. Testing and Test Driven Development
13. Maintaining the software system
14. Evaluation of project, processes and products
15. Glimpse at the future of Software Engineering

Laboratory:

Students will consolidate the discussed topics within a progressive development of a small application that is carried out as an autonomous project work

projektu z zaključno predstavitvijo. Študentje delajo v manjših projektnih skupinah in pri tem uporabljajo agilni pristop. Pomemben del vaj je tudi spoznavanje ter uporaba ustreznih orodij.

with final presentation of results. Students work in small project teams and follow the agile approach. Significant part of the laboratory sessions is the introduction to appropriate tools and their use.

Temeljna literatura in viri / Readings:

- S. L. Pfleeger, J. M. Atlee: **Software Engineering, Theory and Practice**, Pearson, 2010.
- I. Sommerville: **Software Engineering**, Pearson, 2011.
- K. Beck: **Extreme Programming Explained: Embrace the Change**, Addison-Wesley, 2004.

Cilji in kompetence:

Cilj predmeta je spoznati osnove področja tehnologije programske opreme, ki opredeljuje nabor pristopov, metod in orodij za učinkovit razvoj (predvsem obsežnejše) programske opreme. V okviru tega je predstavljen izbran nabor podpodročij, ki v praksi zajemajo bistvene koncepte TPO. Posamezni koncepti so na vajah praktično predstavljeni ob postopnem razvoju manjše aplikacije z uporabo agilnega načina razvoja.

Predvidene kompetence:

- poznavanje različnih pristopov k razvoju programske opreme, posameznih metodologij razvoja in njihovih značilnosti (prednosti in slabosti), s poudarkom na agilnih metodologijah,
- poznavanje posameznih faz razvoja programske opreme,
- priprava načrta projekta s poudarkom na obvladovanju tveganj (identifikacija in obravnavanje tveganj),
- poznavanje različnih načinov opisa uporabniških zahtev (vključno z UML diagrami),

Objectives and competences:

The goal of this course is to present the basics in the area of Software Engineering that defines a set of approaches, methods and tools for efficient software development (especially for larger projects). A selected set of subareas is thus presented that includes most important SE concepts in practice. These concepts are practically presented at tutorials as a step-by-step development of a small application, using agile approach to development.

The competences students gain are:

- use of different approaches to software development, particular development methodologies and their characteristics (relative advantages and disadvantages), with emphasis on agile methodologies,
- familiarity with the phases of software development,
- preparing project plan, with emphasis on risk management (risk identification and approaches to managing risks),
- using different methods for specifying user requirements (including UML diagrams),
- familiarity and use of different architectural styles,

- poznavanje in uporaba arhitekturnih stilov,
- poznavanje glavnih principov načrtovanja (modularnost, povezanost modulov in kohezija, skrivanje informacij, splošnost ...) ter uporaba načrtovalskih vzorcev,
- poznavanje različnih pristopov in tehnik testiranja (na nivoju enot, integracije in sistema) ter osnovnih principov testno vodenega razvoja,
- poznavanje in uporaba različnih orodij za podporo razvoju programske opreme (kot so sistemi za kontrolo različic, integrirana razvojna okolja, orodja za avtomatizirano testiranje enot in podobno).

- familiarity with the main design principles (modularity, coupling and cohesion, information hiding, generality etc.), and use of design patterns,
- familiarity with different approaches and techniques for testing (on unit, integration, and system level), and fundamental principles of test-driven development,
- familiarity and use of different tools in support of the software development (e.g. version control systems, IDE, automated unit testing tools).

Predvideni študijski rezultati:

Znanje in razumevanje:
Poznavanje področja tehnologije programske opreme.

Uporaba:
Razvoj programske opreme, izbira ustreznega pristopa k razvoju.

Refleksija:
Spoznavanje in razumevanje kompleksnosti priprave in izvedbe projekta razvoja programske opreme.

Prenosljive spretnosti - niso vezane le na en predmet:
Primeren pristop k pripravi in izvedbi projekta, celovit pristop k razvoju programske opreme, delo v skupini.

Intended learning outcomes:

Knowledge and understanding:
Knowledge of Software Engineering area.

Application:
Software development, selecting a suitable approach to development.

Reflection:
Knowing and understanding the complexity of preparation and realization of software development projects.

Transferable skills:
A suitable approach to preparation and realization of a project, complete approach to software development, team work.

Metode poučevanja in učenja:

Learning and teaching methods:

<p>Predavanja se izvajajo frontalno, s praktičnimi demonstracijami.</p> <p>Delo na vajah poteka individualno ali v skupinah, pod mentorstvom asistenta.</p>	<p>Lectures are carried out ex-cathedra with practical demonstrations.</p> <p>Work at the laboratory sessions is individual or in groups under the supervision of teaching assistants.</p>
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način: pisni izpit, sprotne naloge, projekt, predstavitev projekta.</p> <p>Sprotno preverjanje: domače naloge, naloge na vajah, projektno delo.</p> <p>Končno preverjanje: kolokviji ali pisni izpit.</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type: written examination, coursework, project, project presentation.</p> <p>Continuing: homework, exercises, project work.</p> <p>Final: midterm exams or written exam.</p> <p>Grading: 6-10 pass, 5 fail (according to the Statutes of the University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

ROŽANC, Igor, SLIVNIK, Boštjan. Using reverse engineering to construct the platform independent model of a web application for student information systems. Computer science and information systems, ISSN 1820-0214. [Print ed.], 2013, vol. 10, no. 4, str. 1557-1583, ilustr. <http://www.comsis.org/archive.php?show=pprmd276-1212>, doi: [10.2298/CSIS121218068R](https://doi.org/10.2298/CSIS121218068R). [COBISS.SI-ID [10226516](#)]

ROŽANC, Igor, SLIVNIK, Boštjan. On the appropriateness of domain-specific languages derived from different metamodels. V: QUATIC 2014 : proceedings. Piscataway: IEEE, cop. 2014, str. 190-195, ilustr. [COBISS.SI-ID [10801236](#)]

MAHNIČ, Viljan, ROŽANC, Igor. Students' perceptions of Scrum practices. V: BILJANOVIĆ, Petar (ur.). MIPRO 2012 : 35th International Convention, May 21-25, 2012, Opatija - Adriatic Coast, Croatia : mipro proceedings, MIPRO 2012, 35th International Convention, May 21-25, 2012, Opatija - Adriatic Coast, Croatia, (MIPRO ... (CD-ROM), ISSN 1847-3946). Rijeka: Croatian Society for Information and Communication Technology, Electronics and Microelectronics - MIPRO, cop. 2012, str. 1364-1369, graf. prikazi. [COBISS.SI-ID [9194836](#)]

ROŽANC, Igor, MAHNIČ, Viljan. Poučevanje kakovosti programske opreme s poudarkom na modelu PSP. V: RAJKOVIČ, Vladislav (ur.), URBANČIČ, Tanja (ur.), BERNIK, Mojca (ur.). Vzgoja in izobraževanje v informacijski družbi, (Organizacija, ISSN 1318-5454, Letn. 38, 2005, št. 8). Kranj: Moderna organizacija, 2005, str. 454-464. [COBISS.SI-ID [16019686](#)]

ROŽANC, Igor, MAHNIČ, Viljan. Experience in teaching software quality engineering using TSP and PSP. V: PUDLOWSKI, Zenon J. (ur.). Congress proceedings. Melbourne: UNESCO International Centre for Engineering Education (UICEE), Faculty of Engineering, Monash University, cop. 2006, str. 159-162, ilustr. [COBISS.SI-ID [5637204](#)]

Celotna bibliografija je dostopna na SICRISu:

<http://splet02.izum.si/cobiss/BibPersonal.jsp?init=t&code=13564>

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Diplomski seminar

Course title: Diploma seminar

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	3	letni
Professional study program Computer and Information Science, 1st cycle	none	3	spring

Vrsta predmeta / Course type

obvezni predmet / compulsory course

Univerzitetna koda predmeta / University course code:

63770

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	10	5	/	/	120	6

Nosilec predmeta / Lecturer:

prof. dr. Franc Solina in vsi ustrezno habilitirani pedagogi

Jeziki /

Predavanja / Lectures:

slovenščina

Languages:

Slovene

Vaje / Tutorial:

slovenščina

Slovene

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

Prerequisites:

Pogoj za vključitev v delo je vpis v 3. letnik študija. Študent lahko opravi vse obveznosti pri predmetu šele po tem, ko opravi vse preostale obveznosti na študijskem programu.

Enrollment into 3rd year of studies. The course work may be completed in full only after the student has passed all other requirements of the study programme.

Vsebina:

Predavanja:

Poduk o pomenu in poteku izdelave diplomskega dela. Etika in plagiatorstvo.

1. naloga: vsak študent izbere mentorja in temo diplomskega dela!

Predavanja:

Kako se lotimo iskanja in pregledovanja relevantne literature za izbrano temo. Vizualno in logično urejanje besedil. Pisanje strokovnih besedil (vrste, struktura, citiranje, priprava, jezik, recenziranje). Zaznavne in komunikacijske sposobnosti pri človeku (vid, sluh, otip, govor, pisava, neverbalno komuniciranje).

Vaje: Google Scholar, Microsoft Academic Research, Web of Knowledge, Cobiss in SICRIS, ePrints.FRI, LaTeX in BibTeX.

2. naloga: vsak študent pregleda širše področje teme svojega diplomskega dela in o tem napiše pregledni članek.

Predavanja:

Pomen obvladovanja osebne produktivnosti, projektni pristop k doseganju ciljev (tradicionalni, adaptivni in ekstremni projekti),

vizualizacijske metode za kreativne procese (miselne skice itd.). Govorne predstavitve (načrtovanje, projekcijski materiali, nastop).

Vaje: oblikovanje čimbolj jasno oblikovanih ciljev

Content (Syllabus outline):

Lectures:

Instruction on the purpose and process of preparing a diploma thesis. Ethics and plagiarism.

Homework 1: every student must select a mentor and a topic of his diploma thesis!

Lectures:

How to start with searching and studying the relevant literature for the selected topic. Visual and logical text editing. Writing of technical texts (types, structure, citing, preparation, language, reviewing). Perceptual and communicative capabilities of humans (sight, hearing, touch, speaking, writing, non-verbal communication).

Tutorial: Google Scholar, Microsoft Academic Research, Web of Knowledge, Cobiss and SICRIS, ePrints.FRI, LaTeX and BibTeX.

Homework 2: every student writes an overview article on the topic of his diploma thesis.

Lectures:

Managing of personal productivity, project based approach to reaching goals (traditional, adaptive and extreme projects), visualization methods for creative processes (mind maps etc.). Oral presentations (planning, projection materials, presentation).

Tutorial: outline of clearly defined goals of the diploma thesis and definition of steps in reaching these goals. Methods for personal productivity

diplomskega dela in določanje korakov za njihovo doseganje. Metode za osebno produktivnost (Getting Things Done, Pomodoro), orodja za vizualizacijo miselnih vzorcev, orodja za pripravo projekcijskih materialov (MS PowerPoint, Impress, Prezi).

3. naloga: priprava govorne predstavitve o temi diplomskega dela (pregled, problem, načrtovana rešitev).

Pred govornim nastopom v okviru vaj mora vsebino predstavitve vsakemu študentu potrditi njegov mentor diplomskega dela!

Spodbuja se diskusija po govornih nastopih!

Predavanja:

Znanstveno publiciranje (konference, revije, knjige, elektronske publikacije, odprt dostop, recenzije), zmogljivosti medmrežja (komuniciranje, okolja za sodelovanje, podatkovne zbirke, znanstvena in strokovna socialna omrežja), zaščita intelektualne lastnine (patenti, licence, avtorske pravice), kreativnost in načrtovanje kariere.

Vaje: individualno posvetovanje z asistenti o diplomskem delu – tutorski način dela.

4. naloga: študent pripravi osnutek svojega diplomskega dela v ciljnem formatu s pomočjo ustreznega vzorca, ki bo ustrezno razčlenjen na poglavja. Pregledni članek in literaturo že ustrezno vključi v dokument. Pri tistih poglavjih, ki še ne bodo do konca napisana, točno določi korake, ki ga bodo pripeljali do zaključka diplomskega dela.

Izdelava in zagovor diplomskega dela: Poleg predavanj zajema predmet tudi izdelavo in zagovor diplomskega dela v sodelovanju z izbranim mentorjem.

(Getting Things Done, Pomodoro), tools for visualization of mind maps, tools for preparation of projection materials (MS PowerPoint, Impress, Prezi).

Homework 3: preparation of oral presentation on the diploma thesis (overview, problem, solution).

Before the oral presentation in the framework of the tutorial every student must get an approval of the contents of the presentation from his diploma mentor! Discussion after each presentation is encouraged!

Lectures:

Scientific publication (conferences, journals, books, e-publications, open access, reviews), resources on the Internet (communication, tools for cooperation, data bases, scientific social networks), protection of intellectual property (patents, licences, author rights), creativity and career planning.

Tutorial: individual consultation with assistants about the diploma thesis – tutor approach.

Homework 4: every student prepares the outline of his/hers diploma thesis in the final format with the help of the necessary template by giving the chapter structure. The overview article and literature must be already integrated in the thesis outline. For the unfinished chapters, clear steps must be outlined what needs to be done in order to finish the diploma thesis.

Completion and defense of the diploma thesis: in addition to the lectures, the course includes individual work on the diploma thesis under the supervision on the thesis advisor.

Temeljna literatura in viri / Readings:

1. Joseph A. Devito. Human Communication, The Basic Course. 11th Edition, Allyn & Bacon, 2008.
2. M. Hladnik. **D**Praktični spisovnik ali Šola strokovnega ubesedovanja, 6. spremenjena izd., Filozofska fakulteta, Univerza v Ljubljani, Ljubljana, 2002.
3. R. K. Wysocki, R. McGary. Effective Project Management, Traditional, Adaptive, Extreme, 3rd Edition. Wiley, Indianapolis, IN, 2003.
4. D. Allen. Getting Things Done: The Art of Stress-Free Productivity. Penguin Books, 2001.
5. internetni viri za preiskovanje znanstvene literature (Google Scholar, Microsoft Academic Research, Web of Knowledge, Cobiss, SICRIS).

Cilji in kompetence:

Cilj predmeta je izdelava diplomskega dela, zaključne naloge na študijskem programu.

Študenta želimo na strukturiran način pripeljati vse študente do dobro napisanega diplomskega dela, v skladu z vsemi strokovnimi in etičnimi zahtevami

Okvir diplomskega seminarja bo poskrbel, da se na projektni način lotijo dela na diplomskem delu. Mentor pri diplomskem delu, ki si ga bo študent moral izbrati, bo imel vlogo naročnika, ki bo skupaj s študentom definiral temo diplomskega dela. Diplomski seminar pa bo poskrbel da bo delo na diplomskem delu napredovalo po predvidenem terminskem načrtu in na metodološko primeren način.

Po vsebinski plati bo torej delo posameznega študenta v okviru diplomskega seminarja določeno z njegovo izbrano diplomsko temo, predavanja pa bodo pokrila splošna znanja o tem, kako se lotiti tega dela in na kaj je potrebno paziti (organizacija dela, osebna produktivnost, preiskovanje literature, spletne zmogljivosti, pisanje, citiranje, ocenjevanje, objavlanje, govorne predstavitve, intelektualna lastnina, etika). Vaje pri predmetu pa bodo poskrbele, da bodo rezultati študentskega

Objectives and competences:

The goal of the course is to write the diploma thesis.

Within the course we direct a student in structured way to a successfully completed diploma thesis which meets all the required professional and ethical standards.

The framework of this course will assure that the students will take a project based approach to their diploma theses. The thesis advisor selected by the student from among the faculty will, together with the student, define the topic of the thesis. The Diploma seminar will assure that the work on the thesis will progress according to the defined schedule and using proper methodology.

The actual work of each student in this diploma seminar will be determined by the selection of his diploma topic, while the lectures will cover general knowledge on how to approach this work (organization of work, personal productivity, searching of literature, Internet resources, writing, citing, reviewing, publishing, oral presentations, intellectual property, ethics). Tutorials will assure that all results of the student's work will be carefully and timely evaluated at least on formal basis, so

dela sproti in skrbno pregledani vsaj po formalni plati, tako da se bodo mentorji diplomskih del lahko osredotočili le na vsebinske vidike.

Cilj predmeta je tudi pretok idej in krepitev kolektiva znotraj generacije na osnovi diskusij po ustnih nastopih.

that the mentors of diploma theses will be able to concentrate solely on the actual contents.

The goal of the seminar is also to encourage the flow of ideas and discussions within each generation of students after oral presentations.

Predvideni študijski rezultati:

Znanje in razumevanje:

vizualno in logično urejanje tekstov, strokovni jezik, akademsko publiciranje, bibliometrija, intelektualna lastnina (patenti, licence, avtorske pravice), etika in plagiatstvo, projektni pristop k doseganju ciljev (klasični, adaptivni in ekstremni projekti), delo v skupini, javno komuniciranje (ustno, tradicionalni mediji, medmrežje), kreativnost in načrtovanje kariere.

Uporaba:

Orodja za pisanje akademskih tekstov (LaTeX, BibTeX), orodja za iskanje in pregledovanje literature (Google Scholar, Microsoft Academic Research, Web of Knowledge, Cobiss in SICRIS), orodja za govorne predstavitve (MS Power Point, Impress, Prezi), sistemi osebne produktivnosti (Getting Things Done, Pomodoro), okolja za sodelovanje na medmrežju, podatkovne zbirke.

Refleksija:

Spoznanje, da je uspešno komuniciranje o rezultatih svojega dela predpogoj za njegovo ustrezno vrednotenje.

Prenosljive spretnosti - niso vezane le na en predmet:

Iskanje informacij, sposobnost predstavitve dosežkov v pisni obliki in v obliki ustne prezentacije so nujen del dobre inženirske izobrazbe.

Intended learning outcomes:

Knowledge and understanding:

visual and logical text editing, technical language, academic publishing, bibliometry, intellectual property (patents, licences, author rights), ethics and plagiarism, project approach to achieving goals (classical, adaptive and extreme projects), work in groups, public communication (oral, traditional media, Internet), creativity and career planning.

Application:

Tools for writing of academic texts (LaTeX, BibTeX), tools for searching and overviewing literature (Google Scholar, Microsoft Academic Research, Web of Knowledge, Cobiss and SICRIS), tools for oral presentations (MS Power Point, Impress, Prezi), systems for personal productivity (Getting Things Done, Pomodoro), environments for cooperation on the Internet, databases for research.

Reflection:

Realization that successful communication of the results of one's own work is a necessary prerequisite for its proper assessment.

Transferable skills:

Search for information, the ability to present results in written form and in the form of oral presentations are an essential part of any good engineering education.

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

Individualno delo z mentorjem. Predavanja, praktične vaje z ustnimi nastopi, seminarski način dela pri domačih nalogah, tutorski način dela.	Individual work with thesis advisor. Lectures and tutorials, oral presentations, homeworks and tutor based instruction.
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

2. naloga (pregledni članek)	10%	Homework 2
3. naloga (govorni nastop)	10%	Homework 3
4. naloga (osnutek dipl. dela)	10%	Homework 4
pisni test o snovi s predavanj	10%	Written test
napisano diplomsko delo	40%	Written diploma thesis
zagovor diplomskega dela	20%	Defense
Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).		Grading: 6-10 pass, 5 fail (according to University Statute).

Reference nosilca / Lecturer's references:**Pet najpomembnejših del:**

F. Solina and R. Bajcsy.

Recovery of parametric models from range images: The case for superquadrics with global deformations.

IEEE Transactions on Pattern Analysis and Machine Intelligence, PAMI-12(2):131-147, 1990.

A. Leonardis, A. Jaklič, and F. Solina.

Superquadrics for segmentation and modeling range data.

IEEE Transactions on Pattern Recognition and Machine Intelligence, PAMI-19(11):1289-1295, 1997.

P. Peer, F. Solina.

Panoramic Depth Imaging: Single Standard Camera Approach.

International Journal of Computer Vision, 47(1/2/3):149--160, 2002.

F. Solina. 15 seconds of fame. Leonardo (Oxf.), 37(2): 105-110, 125, 2004.

J. Krivic, F. Solina. Part-level object recognition using superquadrics.

Computer vision and image understanding, 95(1):105-126, 2004.

A. Jaklič, A. Leonardis, F. Solina.

Segmentation and Recovery of Superquadrics}, volume 20 of

Computational imaging and vision. Kluwer, Dordrecht, 2010.

Celotna bibliografija je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=6749>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Elektronsko in mobilno poslovanje
Course title:	Electronic and Mobile Business

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	zimski
Professional study program Computer and Information Science, 1st cycle	none	2	fall

Vrsta predmeta / Course type izbirni predmet /elective course

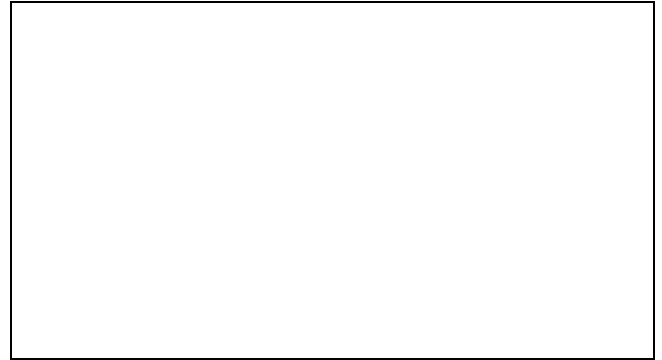
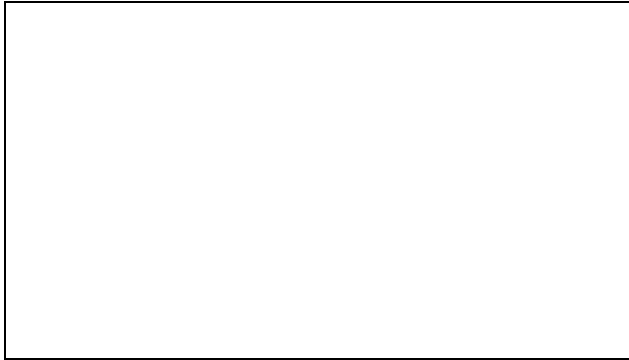
Univerzitetna koda predmeta / University course code: 63712

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer: doc. dr. Rok Rupnik

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

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

**Vsebina:****Predavanja:**

1. Informacijski sistemi ter elektronsko in mobilno poslovanje
2. Organizacijski modeli elektronskega poslovanja
3. CRM sistemi
4. Uvajanje elektronskega poslovanja v podjetja
5. Upravljanje odnosov s strankami
6. Upravljanje nabavnih verig
7. ERP sistemi
8. Mobilne aplikacije
9. Modeli mobilnih aplikacij
10. Specializirane mobilne naprave
11. Internet stvari

Vaje:

1. Razvoj mobilnih aplikacij za različne platforme: Android, BlackBerry 10 in Windows 8

Content (Syllabus outline):**Lectures:**

1. Information systems and electronic and mobile business
2. Organizational models of electronic business (e-business)
3. CRM systems
4. Inception of e-business into companies
5. Customer relationship management
6. Supply chain management
7. ERP systems
8. Mobile applications
9. Mobile applications models
10. Specialised mobile devices
11. Internet of things

Exercises:

1. Development of mobile applications for various platforms: Android, BlackBerry 10 and Windows 8

Temeljni literatura in viri / Readings:

1. Integrated Business Processes with ERP Systems, Simha R. Magal, Jeferry Word, Willey, 2011
2. CRM at the Speed of Light, Fourth Edition: Social CRM 2.0 Strategies, Tools, and Techniques for Engaging Your Customers, Paul Greenberg, 2009
3. Electronic Business, Geoffrey Sampson, BCS, 2010

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

Cilj predmeta je študentom predstaviti koncepte elektronskega in mobilnega poslovanja. Študentje spoznajo vlogo in pomen različnih oblik elektronskega poslovanja. Spoznajo pa tudi temeljne koncepte sprememb v organizaciji in poslovnih procesih, do katerih pride ob uvajanju elektronskega in mobilnega poslovanja.

V okviru predmeta študentje spoznajo tudi najpomembnejše sisteme na področju elektronskega poslovanja, predvsem ERP sisteme in sisteme Upravljanja odnosov s strankami.

Mobilne aplikacije in mobilno poslovanje so področja, ki so študentom predstavljena kot nadgradnja elektronskemu poslovanju. Študentje spoznajo evaluacijske stopnje uvajanja mobilnega poslovanja in načine uvajanja mobilnega poslovanja. V okviru področja mobilnih aplikacij predstavimo kontekstno odvisnost kot element zagotavljanja, da mobilni uporabnik uporablja mobilnosti primerne in mobilnosti prilagojene mobilne aplikacije.

Mobilno poslovanje postaja vse bolj realnost, zato predmet pokriva tudi področje specializiranih mobilnih naprav in interneta stvari.

The aim of the course is to introduce the basic concepts of electronic and mobile business.

We introduce students the role and the value of various forms of electronic business.

Based on that we present basic concepts of organization transformation and business process renovation and reengineering which emerge as part of introducing of electronic and mobile business to organizations.

Through the course students get familiar with ERP systems, CRM systems and SCM systems.

We introduce mobile business as the extension of electronic business. Students get familiar with the evaluation of introducing of mobile business to the organizations. We put significant emphasis to context awareness of mobile applications as the element which assures mobile applications to be mobility suitable and mobility adapted.

Mobile business is becoming the reality and for that reason course also introduces specialized mobile devices and Internet of things.

Predvideni študijski rezultati:

Znanje in razumevanje:

Razumevanje vloge in pomena elektronskega in mobilnega poslovanja;

Poznavanje in razumevanje organizacijskih konceptov in potreb po sprememb v poslovnih procesih pri elektronskem in mobilnem poslovanju;

Poznavanje in razumevanje različnih sistemov: ERP sistemi, Sistemi upravljanja odnosov s strankami in Sistemi upravljanja nabavnih verig, Poznavanje osnov metodologije uvajanja ERP sistemov;

Uporaba:

Uporaba metodologije uvajanja ERP sistemov v praksi za majhna podjetja;

Uporaba znanj o mobilnih aplikacijah pri razvoju mobilnih aplikacij;

Intended learning outcomes:

Knowledge and understanding:

The understanding of the role and importance of electronic and mobile business; the understanding of organizational concepts and concepts of changes needed when introducing electronic and mobile business to the organizations; the understanding of concepts of ERP (Enterprise Resource Planning) systems, CRM (Customer Relationship Management) and SCM (Supply Chain Management); the understanding of basic concepts of ERP systems implementation methodology;

Application:

The application of the use of methodology of the implementation of ERP implementation methodology for small companies; the use of understanding of concepts of mobile applications at mobile applications development; the application of concepts of electronic business and mobile business

<p>Uporaba razumevanja konceptov e-poslovanja in m-poslovanja pri opredeljevanju informacijskih potreb v okviru informacijskih sistemov.</p> <p>Refleksija:</p> <p>Spoznavanje in razumevanje potreb poslovnih sistemov pri odpiranju svojih meja in uvajanju e-poslovanja zaradi potreb povezovanja z drugimi poslovnimi sistemi;</p> <p>Razpoznavanje in razumevanje informacijskih potreb v stanju mobilnosti.</p> <p>Prenosljive spretnosti - niso vezane le na en predmet:</p> <p>Uporaba razumevanja konceptov e-poslovanja in m-poslovanja pri opredeljevanju informacijski potreb v splošnem;</p> <p>Uporaba razumevanja konceptov e-poslovanja in m-poslovanja pri razvoju informacijskih sistemov.</p>	<p>at defining of business needs within information systems.</p> <p>Reflection:</p> <p>The identification and understanding of business needs of business systems at e-business and m-business implementation with emphasis on needs of integration with other business systems; the identification and understanding of informational needs at the state of mobility.</p> <p>Transferable skills:</p> <p>The application and understanding of concepts of e-business and m-business at identifying of informational needs in general; The application and understanding of concepts of e-business and m-business at information systems development.</p>
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Metode poučevanja in učenja:

<p>Predavanja (tudi vabljeni predavatelji, ki so ugledni in uveljavljeni strokovnjaki na področju elektronskega in mobilnega poslovanja).</p> <p>Seminarske naloge v okviru vaj, kjer bo prisotno tudi skupinsko delo.</p>
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Learning and teaching methods:

<p>Lectures (including invited lecturers that are well-known and have excellent reputation in the fields of electronic and mobile business).</p> <p>Seminar work within exercises, including team-work.</p>

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <ul style="list-style-type: none"> • dve seminarski nalogi • dva kolokvija med semestrom • sodelovanje na predavanjih <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p style="text-align: center;">45%</p> <p style="text-align: center;">45%</p> <p style="text-align: center;">10%</p>	<p>Type (examination, oral, coursework, project):</p> <ul style="list-style-type: none"> • two projects • two examinations during semester • active participation on lectures <p>Grading: 6-10 pass, 5 fail (according to the UL Statues).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

- PIVK, Aleksander, VASILECAS, Olegas, KALIBATIENE, Diana, RUPNIK, Rok. On approach for the implementation of data mining to business process optimisation in commercial companies. Technological and economic development of economy, ISSN 2029-4913. [Print ed.], June 2013, vol. 19, no. 2, str. 237-256. [COBISS.SI-ID 10340948]
- HOVELJA, Tomaž, VASILECAS, Olegas, RUPNIK, Rok. A model of influences of environmental stakeholders on strategic information systems planning success in an enterprise. Technological and economic development of economy, ISSN 2029-4913. [Print ed.], 2013, vol. 19, no. 3, str. 465-488, ilustr. <http://www.tandfonline.com/doi/pdf/10.3846/20294913.2013.818591>, doi: 10.3846/20294913.2013.818591. [COBISS.SI-ID 10183252]
- LAVBIČ, Dejan, VASILECAS, Olegas, RUPNIK, Rok. Ontology-based multi-agent system to support business users and management. Technological and economic development of economy, ISSN 1392-8619. Print ed., 2010, vol. 16, no. 2, str. 327-347, ilustr. http://www.tede.vgtu.lt/upload/ukis_zurn/tede_vol16_no2_327-347_lavbic.pdf. [COBISS.SI-ID 7731796]
- RUPNIK, Rok, KUKAR, Matjaž, KRISPER, Marjan. Integrating data mining and decision support through data mining based decision support system. The Journal of computer information systems, ISSN 0887-4417, 2007, vol. 47, no. 3, str. 89-104, ilustr. [COBISS.SI-ID 5928788]
- VASILECAS, Olegas, DUBAUSKAITÈ, Rūta, RUPNIK, Rok. Consistency checking of UML business model. Technological and economic development of economy, ISSN 2029-4913. [Print ed.], 2011, vol. 17, no. 1, str. 133-150, ilustr. <http://web.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=3&hid=110&sid=e420e188-46e3-4748-8272-b2f3eda0892c%40sessionmgr113>. [COBISS.SI-ID 8607060]

Celotna bibliografija doc. dr. Rupnika je dostopna na SICRISu:
<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=8740>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Podatkovne baze 2
Course title:	Databases 2

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	zimski
Professional study program Computer and Information Science, 1st cycle	none	2	fall

Vrsta predmeta / Course type izbirni predmet /elective course

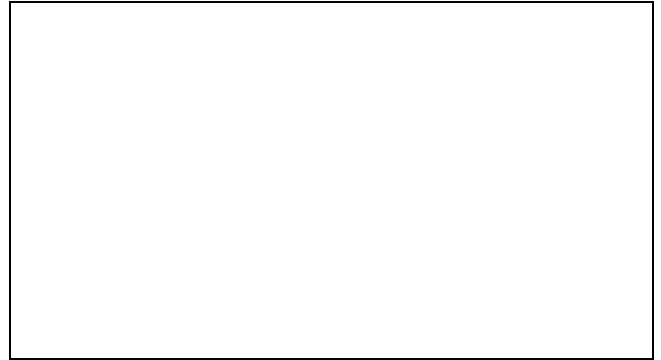
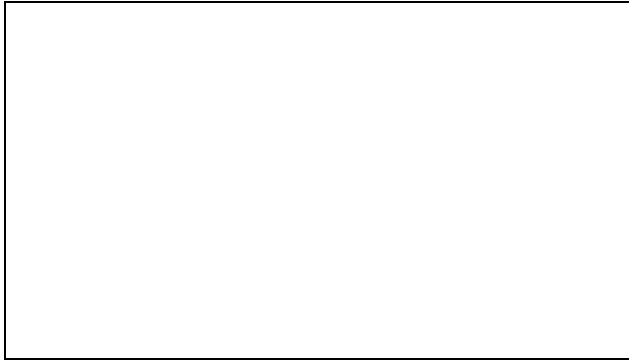
Univerzitetna koda predmeta / University course code: 63713

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer: doc. dr. Damjan Vavpotič

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

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

**Vsebina:**

1. Konceptualno načrtovanje
2. Logično načrtovanje
3. Normalizacija in denormalizacija
4. Fizično načrtovanje ter rekonstrukcija
5. Sočasni dostop do podatkovne baze
6. Obnavljanje podatkovne baze: podatkovne nesreče, načini obnavljanja
7. Optimizacija poizvedb - osnovni pristopi
8. Osnovni pojmi porazdeljenih podatkovnih baz
9. Podatkovna skladišča in sistemi OLAP: osnovni pojmi, načrtovanje, implementacija
10. NoSQL podatkovne baze: tipi NoSQL podatkovnih baz, primerjava z relacijskimi bazami
11. Osnove BigData in paralelnega porazdeljenega procesiranja podatkov
12. Praktični vidiki načrtovanja in administracije podatkovnih baz (parametri zagona, gruče, distribuirana PB) (poudarek na laboratorijskih vajah)

Content (Syllabus outline):

1. Conceptual design
2. Logical design
3. Normalization and de-normalization
4. Physical design and reverse engineering
5. Concurrency control
6. Database recovery: database failures, recovery methods
7. Query Optimization - basic approaches
8. Basic concepts of distributed databases
9. Data warehouses and OLAP systems: basic concepts, design, implementation
10. NoSQL databases: NoSQL database types, NoSQL and relational database comparison
11. Basics of BigData and parallel distributed data processing
12. Practical aspects of database design and administration (startup parameters, clustering, distributed system) (focus on lab sessions)

Temeljna literatura in viri / Readings:

1. Thomas M. Connolly, Carolyn E. Begg (2010). Database Systems, A Practical Approach to Design, Implementation and Management, Fourth Edition, Addison-Wesley.
2. Tomaž Mohorič (2002). Podatkovne baze, Založba Bi-TIM.
3. Raghu Ramakrishnan, Johannes Gehrke (2003). Database Management Systems, Third Edition, McGraw-Hill.

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

Cilj predmeta je predstaviti področja podatkovnega modeliranja, administracije podatkovnih baz, osnov distribuiranih podatkovnih baz, načrtovanjem podatkovnih skladišč, OLAP ter podati kratek pregled področja podatkovnih baz NoSQL.

Predvidene kompetence, ki jih pridobijo študenti:

Splošne kompetence:

- sposobnost kritičnega mišljenja
- razvoj sposobnosti kritičnega, analitičnega in sintetičnega mišljenja
- sposobnost razumevanja in reševanja strokovnih izzivov na področju računalništva in informatike
- sposobnost samostojne uporabe pridobljenega znanja pri reševanju tehničnih in znanstvenih izzivov na področju računalništva in informatike; sposobnost nadgradnje pridobljenega znanja

Predmetno specifične kompetence:

- praktična znanja in veščine na področju strojne opreme, programske opreme in informacijskih tehnologij, ki so nujna za uspešno delo na področju računalništva in informatike
- sposobnost samostojne izvedbe manj zahtevnih in zahtevnih inženirskih in organizacijskih opravil na določenih ozkih področjih in neodvisnega reševanja določenih dobro opredeljenih opravil na področju računalništva in informatike
- Poznavanje in uporaba tehnik in pristopov za modeliranje relacijskih podatkovnih baz
- Priprava konceptualnega načrta podatkovne baze
- Priprava logičnega načrta podatkovne baze
- Poznavanje in uporaba tehnik normalizacije in de-normalizacije
- Poznavanje in uporaba postopkov fizičnega načrtovanja podatkovne baze
- Razumevanje problematike sočasnega dostopa do podatkovne baze in pristopov za nadzor sočasnosti
- Poznavanje in uporaba osnovnih pristopov za optimizacijo poizvedb
- Razumevanje osnov porazdeljenih podatkovnih baz

The course presents the fields of data modelling, database administration, basics of distributed databases, data warehouse design, OLAP and a short overview of the field of NoSQL databases.

The competences students gain are:

General competences:

- ability of critical thinking
- developing skills in critical, analytical and synthetic thinking
- the ability to understand and solve professional challenges in computer and information science
- the ability to apply acquired knowledge in independent work for solving technical and scientific problems in computer and information science; the ability to upgrade acquired knowledge

Subject specific competences:

- practical knowledge and skills of computer hardware, software and information technology necessary for successful professional work in computer and information science
- the ability to independently perform both less demanding and complex engineering and organisational tasks in certain narrow areas and independently solve specific well-defined tasks in computer and information science
- Knowledge and use of relational database modelling techniques
- Preparation of database conceptual design
- Preparation of database logical design
- Knowledge and use of normalization and de-normalization techniques
- Knowledge and use of approaches for database physical design
- Understanding the problem of concurrent access to databases and approaches to concurrency control
- Knowledge and use of basic approaches for query optimization
- Understanding the basics of distributed databases

- Razumevanje osnovnih konceptov, načrtovanja in implementacije podatkovnih skladišč in sistemov OLAP
- Razumevanje osnovnih konceptov podatkovnih baz NoSQL
- Uporaba sodobnih orodij za modeliranje podatkovnih baz

- Understanding of basic concepts, design and implementation of data warehouses and OLAP systems
- Understanding of basic concepts of NoSQL databases
- Use of modern data modelling tools

Predvideni študijski rezultati:

Znanje in razumevanje:

Poznavanje načinov za obnavljanje podatkovne baze, poznavanje metode modeliranja podatkov, nadzora sočasnega dostopa do podatkov, poznavanje procesa administracije podatkovne baze in poznavanje osnovnih pojmov o podatkovnih skladiščih OLAP sistemih in porazdeljenih podatkovnih bazah. Poznavanje podatkovnih baz NoSQL.

Uporaba:

Uporaba pridobljenega znanja pri inženirskem delu in administraciji podatkovnih baz.

Refleksija:

Spoznavanje in razumevanje uglasenosti med teorijo in prakso s pomočjo praktičnih primerov.

Prenosljive spretnosti - niso vezane le na en predmet:

Uporaba pristopa za modeliranje podatkov predstavlja sistematični pristop za načrtovanje, ki je v računalništvu splošno uporabljena metoda.

Intended learning outcomes:

Knowledge and understanding:

Knowledge of database recovery, knowledge of data modelling, concurrency control, database administration knowledge and familiarity with basic concepts of data warehouses, OLAP systems and distributed databases. Familiarity with NoSQL databases.

Application:

Using knowledge in engineering work and database administration.

Reflection:

Awareness and understanding of tunefulness between theory and practice through practical examples.

Transferable skills:

The use of data modelling approach is a systematic approach to planning, which is a commonly used method in the field of computing.

Metode poučevanja in učenja:

Predavanja (tudi vabljeni predavatelji, ki so vrhunski strokovnjaki na področju podatkovnih baz), laboratorijske vaje z uporabo računalniških orodij in reševanje teoretičnih nalog, domače naloge s poudarkom na skupinskem delu.

Learning and teaching methods:

Lectures (including invited speakers who are top experts in the field of databases), lab sessions with use of computer tools and theoretical tutorials, homework with focus on teamwork.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt): Sprotno preverjanje (domače naloge, kvizi, kolokviji) Končno preverjanje (pisni izpit) Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).	50% 50%	Type (examination, oral, coursework, project): Continuing (homework, quizzes, midterm exams) Final (written exam) Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

- Damjan Vavpotič, Marko Bajec, "An approach for concurrent evaluation of technical and social aspects of software development methodologies", Inf. softw. technol., vol. 51, no. 2, str. 528-545, 2009
- Damjan Vavpotič, Olegas Vasilecas, "An approach for assessment of software development methodologies suitability", Elektron. elektrotech., vol. 114, no. 8, str. 107-110, 2011
- Damjan Vavpotič, Tomaž Hovelja, "Improving the evaluation of software development methodology adoption and its impact on enterprise performance", Comput. Sci. Inf. Syst., vol. 9, no. 1, str. 165-187, Jan. 2012
- Simon Vrhovec, Marina Trkman, Aleš Kumer, Marjan Krisper, Damjan Vavpotič, "Outsourcing as an economic development tool in transition economies : scattered global software development", Inf. technol. dev., 25 str., 2014
- Tomaž Hovelja, Olegas Vasilecas, Damjan Vavpotič, Exploring the influences of the use of elements comprising information system development methodologies on strategic business goals, Tech. and eco. devel. of eco., vol. 21, no. 6, str. 885-898, 2015

Celotna bibliografija doc. dr. Vavpotiča je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=13311>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Informacijski sistemi
Course title:	Information Systems

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	zimski
Professional study program Computer and Information Science, 1st cycle	none	2	fall

Vrsta predmeta / Course type izbirni predmet /elective course

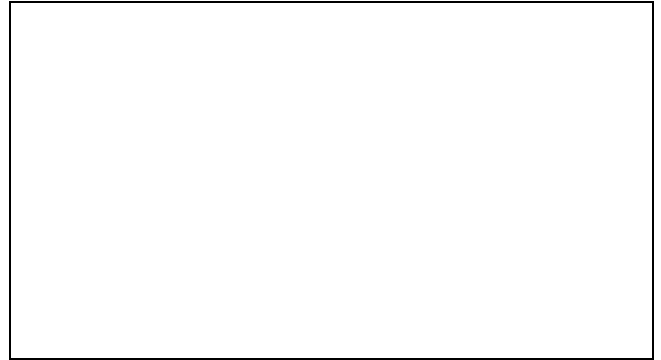
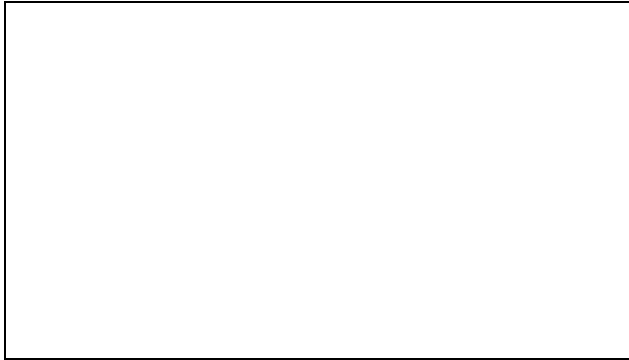
Univerzitetna koda predmeta / University course code: 63714

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	10	20	/	/	105	6

Nosilec predmeta / Lecturer: doc. dr. Damjan Vavpotič

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

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

**Vsebina:**

1. Temeljni pojmi: podatek, informacija, znanje
2. Informacijska družba
3. Osnove informacijskih sistemov
4. Informacijski Sistemi za podporo operativnim nalogam: Transakcijski sistemi, Sistemi za nadzorovanje procesov, Sistemi za poslovno sodelovanje
5. Sistemi za podporo vodenju: Upravljavski IS, Odločitveni IS, Direktorski IS
6. Specializirani sistemi za procesiranje podatkov: Ekspertni sistemi, Strateški IS, Sistemi za upravljanje znanja, Funkcionalni informacijski podsistemi
7. Tipični funkcionalni informacijski podsistemi: Prodajni podsistem, Kadrovski podsistem, Finančni podsistem, Računovodski podsistem, Proizvodni podsistem
8. Poslovno informacijska arhitektura
9. Integriran poslovno informacijski sistem (ERP)
10. Sistem za upravljanje odnosov s strankami (CRM)
11. Sistemi za upravljanje oskrbovalne verige (SCM)
12. Informacijski sistemi kot podpora poslovnemu sistemu in poslovnim procesom
13. Osnove modeliranja poslovnih procesov

Content (Syllabus outline):

1. Key concepts: data, information, knowledge
2. Information society
3. Fundamentals of information system
4. Operations support systems: Transaction processing systems, Process control systems, Enterprise collaboration systems
5. Management support systems: Management IS, Decision support IS, Executive IS
6. Specialized processing systems: Expert systems, Strategic IS, Knowledge Management Systems, Functional Business Systems
7. Typical Functional Business systems: Marketing, Human Resource Management, Finance, Accounting, Production
8. Enterprise IT architecture
9. Enterprise resource planning
10. Customer Relationship Management
11. Supply Chain Management
12. Information system as a support for business system and business processes
13. Fundamentals of business process modelling
14. Key information technologies for IS support (e.g. OLAP, data warehouse, enterprise portals)
15. Overview of typical architectures for distributed IS including SOA
16. Modern platforms for IS development (focus in lab sessions)
17. Practical aspects of development of web-based information systems (focus in lab session)

14. Ključne informacijske tehnologije za podporo IS (npr. OLAP, podatkovna skladišča, poslovni portali)
15. Pregled tipičnih arhitektur za porazdeljene IS vključno s SOA
16. Sodobne platforme za razvoj IS (poudarek na laboratorijskih vajah)
17. Praktični vidiki razvoja spletnih informacijskih sistemov (poudarek na laboratorijskih vajah)

Temeljni literatura in viri / Readings:

- O'Brien J. A., Marakas G. M., Management Information Systems, seventh edition (tenth editin), McGraw-Hill/Irwin, 2006 (2011).
- Stair R., Reynolds G., Principles of information systems, eight edition, Thomson Course Technology, 2008
- Steven Alter, Information Systems – A Management Perspective, third edition, Addison-Wesley, 1999.

Dodatna literatura za razvojna okolja, ki se uporabljajo na vajah.

Additional literature related to the development environments used in lab sessions.

Cilji in kompetence:

Cilj predmeta je študentom računalništva in informatike pregledno predstaviti ključne koncepte s področja informacijskih sistemov in jim omogočiti razumevanje delovanja in vloge sodobnih informacijskih sistemov v okviru poslovnih sistemov.

Predvidene kompetence, ki jih pridobijo študenti:

Splošne kompetence:

- sposobnost kritičnega mišljenja
- razvoj sposobnosti kritičnega, analitičnega in sintetičnega mišljenja
- sposobnost razumevanja in reševanja strokovnih izzivov na področju računalništva in informatike
- sposobnost strokovne komunikacije v maternem kot tudi v tujem jeziku
- sposobnost samostojne uporabe pridobljenega znanja pri reševanju tehničnih in znanstvenih izzivov na področju računalništva in informatike; sposobnost nadgradnje pridobljenega znanja

Objectives and competences:

The course objective is to presents the key concepts in the field of information systems to the students of computer and information science and enable them to understand the function and the role of modern information systems in the context of business systems.

The competences students gain are:

General competences:

- ability of critical thinking
- developing skills in critical, analytical and synthetic thinking
- the ability to understand and solve professional challenges in computer and information science
- the ability of professional communication in the native language as well as a foreign language
- the ability to apply acquired knowledge in independent work for solving technical and scientific problems in computer and information science; the ability to upgrade acquired knowledge

Predmetno specifične kompetence:

- osnovne veščine na področju računalništva in informatike, ki vključujejo osnovne teoretične veščine, praktično znanje in ključne veščine za področje računalništva in informatike
- sposobnost razumevanja in uporabe znanja s področja računalništva in informatike na drugih relevantnih tehničnih področjih (ekonomija, organizacijske znanosti itd.)
- praktična znanja in veščine na področju strojne opreme, programske opreme in informacijskih tehnologij, ki so nujna za uspešno delo na področju računalništva in informatike
- osnovne veščine na področju računalništva in informatike, ki omogočajo nadaljevanje študija na drugi stopnji

- poznavanje terminologije s področja informacijskih sistemov v navezavi na poslovne sisteme
- razumevanje razlik med različnimi vrstami informacijskih sistemov
- poznavanje tipičnih funkcionalnih informacijskih podsistemov
- razumevanje vloge poslovno informacijske arhitekture
- poznavanje več-funkcijskih poslovnih informacijskih sistemov (s poudarkom na ERP, SCM in CRM)
- razumevanje razmerja med informacijskim in poslovnim sistemom
- branje in razumevanje modelov poslovnih procesov
- poznavanje ključnih informacijskih tehnologij in njihove vloge v okviru informacijskih sistemov
- poznavanje tipičnih arhitektur porazdeljenih informacijskih sistemov
- osnove veščine implementacije informacijskih sistemov z uporabo sodobnih razvojnih okolij

Subject specific competences:

- basic skills in computer and information science, which includes basic theoretical skills, practical knowledge and skills essential for the field of computer and information science
- the ability to understand and apply computer and information science knowledge to other technical and relevant fields (economics, organisational science, etc.)
- practical knowledge and skills of computer hardware, software and information technology necessary for successful professional work in computer and information science
- basic skills in computer and information science, allowing the continuation of studies in the second study cycle

- knowledge of terminology in the field of information systems in relation to business systems
- understanding the differences between different information system types
- knowledge of typical functional business systems
- understanding the role of enterprise IT architecture
- knowledge of cross-functional enterprise information systems (with focus on ERP, SCM and CRM)
- understanding the relation between information and business system
- reading and understanding of business process models
- knowledge of the key information technologies and their role in the context of information systems
- knowledge of typical architectures of distributed information systems
- Fundamental skills of information systems implementation in modern development environments

Predvideni študijski rezultati:

Intended learning outcomes:

<p>Znanje in razumevanje:</p> <p>Poznavanje osnovnih pojmov s področja informacijskih sistemov. Zmožnost umestitve informacijskega sistema v kontekst poslovnega okolja. Razumevanje vloge informacijskih tehnologij v okviru sodobnih informacijskih sistemov.</p> <p>Uporaba:</p> <p>Uporaba informacijskih tehnologij za razvoj računalniško podprtih informacijskih sistemov.</p> <p>Refleksija:</p> <p>Spoznavanje in razumevanje uglasenosti med teorijo in njeno uglasenostjo na konkretnih primerih s področja informacijskih sistemov (npr. preizkusi delovanja v konkretnem razvojnem okolju).</p> <p>Prenosljive spretnosti - niso vezane le na en predmet:</p> <p>Uporaba IKT, pisno in ustno poročanje, delo v timih, komunikacijske in voditeljske spretnosti pri vodenju in sodelovanju v projekti ekipi.</p>	<p>Knowledge and understanding:</p> <p>Familiarity with basic concepts of information systems. Ability to place an information system in the context of business environment. Understanding the role of information technologies in the context of contemporary information systems.</p> <p>Application:</p> <p>Information technology usage for the development of computer-assisted information systems.</p> <p>Reflection:</p> <p>Familiarization and understanding of alignment between theory and practical examples of real-world information systems (i.e. use cases in specific development environment).</p> <p>Transferable skills:</p> <p>ICT usage, written and oral reporting, team work, communication and management skills in project management and group collaboration.</p>
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Metode poučevanja in učenja:

<p>Predavanja, laboratorijske vaje, seminarske naloge. Poseben poudarek je na seminarskih nalogah, kjer študenti sami razvijejo primer informacijskega sistema in ob tem teoretična znanja prenesejo v prakso.</p>
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Learning and teaching methods:

<p>Lectures, laboratory exercises, seminar work. Special focus is on seminar work, where students develop an example information system and transfer theoretical knowledge into practice.</p>

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, midterm exams, project work)</p> <p>Final (written exam)</p>
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		Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

- Damjan Vavpotič, Marko Bajec, "An approach for concurrent evaluation of technical and social aspects of software development methodologies", Inf. softw. technol., vol. 51, no. 2, str. 528-545, 2009
- Damjan Vavpotič, Olegas Vasilecas, "An approach for assessment of software development methodologies suitability", Elektron. elektrotech., vol. 114, no. 8, str. 107-110, 2011
- Damjan Vavpotič, Tomaž Hovelja, "Improving the evaluation of software development methodology adoption and its impact on enterprise performance", Comput. Sci. Inf. Syst., vol. 9, no. 1, str. 165-187, Jan. 2012
- Simon Vrhovec, Marina Trkman, Aleš Kumer, Marjan Krisper, Damjan Vavpotič, "Outsourcing as an economic development tool in transition economies: scattered global software development", Inf. technol. dev., 25 str., 2014
- Tomaž Hovelja, Olegas Vasilecas, Damjan Vavpotič, Exploring the influences of the use of elements comprising information system development methodologies on strategic business goals, Tech. and eco. devel. of eco., vol. 21, no. 6, str. 885-898, 2015

Celotna bibliografija doc. dr. Vavpotiča je dostopna na SICRISu:
<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=13311>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Organizacija računalnikov
Course title:	Computer Organisation

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	zimski
Professional study program Computer and Information Science, 1st cycle	none	2	fall

Vrsta predmeta / Course type izbirni predmet /elective course

Univerzitetna koda predmeta / University course code: 63717

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	6	24	/	/	105	6

Nosilec predmeta / Lecturer: viš. pred. Robert Rozman

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

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

**Vsebina:**

Temeljni cilj je poglobljen pogled v zgradbo in delovanje računalnika in njegovih sestavnih delov.

Najprej se spoznamo z najenostavnejšim nivojem gradnikov digitalnih integriranih vezij, ki sestavljajo sodobne procesne enote; podrobneje se seznanimo z njihovo zgradbo, realizacijo in delovanjem. Med praktičnimi primeri obravnavamo tudi mikrokontrolerje iz družine ARM in najnovejše modele Intelovih procesorjev (npr. Core i7).

V obsežnejšem delu se posvetimo poglobljenemu delovanju računalniških sistemov s pomočjo vzporednega izvajanja na nivoju ukazov znotraj same procesne enote (cefovod) in potem tudi na nivoju združevanja več enot v sistem (večjedrni procesorji, multiprocesorji, multiračunalniki). Pojasnimo razloge, zakaj razvoj teče predvsem v smeri paralelizacije sistemov in razložimo posledice tako z vidika programerja kot tudi snovalca računalniških sistemov. Ob tem se spoznamo tudi z zgradbo najzmogljivejših računalnikov z velikim številom vzporednih procesnih enot.

Pri vseh omenjenih sistemih so zelo pomembne zmožljive poti za prenose podatkov, ki jih obravnavamo v nadaljevanju (npr. PCI, USB, PCI Express). Zatem pojasnimo še delovanje nekaterih splošno uporabljenih vhodno izhodnih enot in ustreznih načinov prenosa podatkov med njimi (npr. prekinitve, DMA, V/I procesorji).

Pregled vsebine predavanj:

1. Uvod v organizacijo računalnikov in digitalna vezja

Content (Syllabus outline):

The ultimate aim is an in-depth look into the structure and function of the computer and its components.

First of all, we introduce the simplest building blocks of digital integrated circuits, which are assembled into modern processing units; we study their structure, implementation and operation. Among the practical examples we also present microcontrollers from ARM family and the latest models of Intel processors (e.g. Core i7).

In large part, we focus on the speedup of computer systems by means of parallel computation on the instruction level within a single processing unit (pipeline) and then also at the level of aggregation of multiple units in a system (multi-core processors, multi-processors, multi-computers). We explain the reasons why the development runs primarily in the direction of parallelization of the systems and explain the consequences from the perspective of a programmer and a designer of computer systems. In this context, we also study the structure of the most powerful computers with a large number of parallel processing units.

In all these systems, high performance interconnection paths for data transfers are very important and also presented (e.g. PCI, USB, PCI Express). Then we explain the operation of some commonly used input and output devices and adequate data transfer types (e.g. Interrupts, DMA, I/O processors).

An overview of the lectures:

1. Introduction to the organization of computers and digital circuits

<ol style="list-style-type: none"> 2. Osnove integriranih dig. vezij (TTL, CMOS, VLSI) 3. Mikroarhitekturni nivo računalnika (zgradba in delovanje CPE) 4. Paralelizem na nivoju ukazov (cevovod, superskalarni procesorji) 5. Paralelizem na nivoju procesorjev (multiprocesorji, multiračunalniki) 6. Prenosne poti in vrste prenosov (PCI, PCI Express, USB, QPI) 7. Vhodno-izhodni sistem (naprave, načini prenosa podatkov) <p>V okviru laboratorijskih vaj pridobljeno znanje utrjujemo in poglobljamo s programiranjem in uporabo dejanskega sistema z ARM mikrokontrolnikom. Pri tem spoznavamo opisane koncepte tudi s praktičnega vidika.</p>	<ol style="list-style-type: none"> 2. Basics of Integrated Digital circuits (TTL, CMOS, VLSI) 3. Computer at the Micro-architecture level (structure and operation of the CPU) 4. Instruction Level Parallelism (pipeline, superscalar processors) 5. Processor Level Parallelism (Multiprocessors, Multicomputers) 6. Data transmission paths and types of transfers (PCI, PCI Express, USB, QPI) 7. Input-output system (devices, data transfers) <p>In the context of laboratory work, we consolidate and deepen our knowledge with the programming and use of the actual system with ARM microcontroller. In doing so, we learn the concepts described also from a practical point of view.</p>
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Temeljni literatura in viri / Readings:

1. D. Kodek, Arhitektura in organizacija računalniških sistemov, Bi-Tim 2008.
2. A. S. Tanenbaum: Structured Computer Organization, Sixth Edition, Pearson Prentice Hall, 2013.
3. Patterson, Hennessy: Computer Organization and Design, Fifth Edition: The Hardware/Software Interface (The Morgan Kaufmann Series in Computer Architecture and Design), 2013.

Vsa dodatna gradiva (članki, podatkovne listine, besedila) so dosegljiva v spletni učilnici.

Cilji in kompetence:

Podati logično zgradbo in lastnosti gradnikov, ki sestavljajo današnji računalnik in njihove medsebojne povezave. Poudarek je na pridobitvi znanja za praktično delo na področju načrtovanja, implementacije in učinkovitega programiranja računalniških sistemov.

Predvidene kompetence:

- poznavanje terminologije iz področja organizacije računalniških sistemov
- praktična znanja in veščine iz aparaturne, programske in informacijske tehnologije

Objectives and competences:

Introduction to the logical structure and properties of building blocks that make up today's computer and their interconnections. The emphasis is on the acquisition of knowledge for practical work in the field of design, implementation and efficient programming of computer systems.

Planned competencies:

- knowledge of terminology from the field of organization of computer systems
- practical knowledge and skills of computer hardware, software and information technology

<p>potrebna za uspešno strokovno delo na področju računalništva in informatike</p> <ul style="list-style-type: none"> • osnovne veščine v računalništvu in informatiki, ki omogočajo nadaljevanje študija na drugi bolonjski stopnji • sposobnost učinkovitejšega programiranja glede na poznavanje zgradbe in organizacije rač. sistemov • poznavanje omejitev uvajanja paralelizma in učinkovitejša izraba njegovih prednosti • razumevanje osnov delovanja sodobnih sistemov • razumevanje omejitev trenutnih tehnologij in možnosti nadaljnega razvoja • sposobnost učinkovitega programiranja enostavnejših (vgrajenih) računalniških sistemov • načrtovanje in programiranje sistemov z manjšo porabo energije • poznavanje odprtokodnih ali lahko dostopnih orodij za načrtovanje, implementacijo in programiranje računalniških sistemov
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<p>necessary for successful professional work in computer and information science</p> <ul style="list-style-type: none"> • basic skills in computer and information science, allowing the continuation of studies in the second study cycle • ability of effective programming in relation to gained knowledge of the architecture and organization of comp. systems • knowledge of the limits of introducing parallelism and more efficient use of its advantages • understanding of the functioning of modern systems • understanding the limitations of current technologies and possibilities for further development • ability to effectively program simpler (embedded) computer systems • design and program systems with lower energy consumption • knowledge of open source or easily accessible tools for design, implementation and programming of computer systems
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Predvideni študijski rezultati:

<p>Znanje in razumevanje:</p> <p>Poznavanje zgradbe in tehnologij današnjih računalnikov, prenosnih poti in izbranih vhodno izhodnih naprav.</p> <p>Uporaba:</p> <p>Razumevanje organizacije računalnikov je pomembno pri analizi, načrtovanju, implementaciji in uporabi (programiranju) sodobnih računalniških naprav.</p> <p>Refleksija:</p> <p>Z boljšim poznavanjem organizacije računalnikov je njihova uporaba na vseh nivojih bolj učinkovita.</p> <p>Prenosljive spretnosti - niso vezane le na en predmet:</p> <p>Predmet dopolnjuje znanja s področij programiranja, digitalnih vezij in načrtovanja ter implementacije računalniških sistemov.</p>
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Intended learning outcomes:

<p>Knowledge and understanding:</p> <p>Knowledge of the structure and technologies of today's computers, connection paths and selected input output devices.</p> <p>Application:</p> <p>Understanding of computer organization is important in the analysis, design, implementation and use (programming) of modern computing systems.</p> <p>Reflection:</p> <p>Better knowledge of computer organization enhances efficiency of its use at all levels.</p> <p>Transferable skills:</p> <p>Course complements knowledge in the areas of programming, digital circuits, the design and implementation of computer systems.</p>
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Metode poučevanja in učenja:**Learning and teaching methods:**

Predavanja, laboratorijske vaje, domače naloge in projektno delo.

Lectures, laboratory sessions, homework assignments and projects.

Na laboratorijskih vajah spoznavamo delovanje sodobnih procesorjev s pomočjo programiranja v zbirnem jeziku na mikroprocesorskem sistemu na osnovi 32-bitnega mikrokrmilnika ARM.

In the lab, we learn about the operation of modern processors using programming in assembler language on the microprocessor system based on 32-bit ARM microcontroller.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuous (homework, midterm exams, project work)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail</p> <p>(according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:**Pet najpomembnejših del:**

1. ROZMAN, Robert, KODEK, Dušan. Using asymmetric windows in automatic speech recognition. *Speech commun.* [Print ed.], 2007, vol. 49, no. 4, str. [268]-276.
2. ROZMAN, Robert. Enostavnejša zasnova sistema za razpoznavanje govora. *Elektrotehniški vestnik*, ISSN 0013-5852. [Slovenska tiskana izd.], 2013, letn. 80, št. 4, str. 171-176, ilustr.
3. ROZMAN, Robert, KODEK, Dušan. Improving speech recognition robustness using non-standard windows. V: ZAJC, Baldomir (ur.), TKALČIČ, Marko (ur.). *The IEEE Region 8 EUROCON 2003: computer as a tool: 22-24. September 2003, Faculty of Electrical Engineering, University of Ljubljana, Ljubljana, Slovenia: proceedings. Piscataway: IEEE, cop. 2003, vol. 2, str. 171-174, graf. prikazi.*
4. ROZMAN, Robert. MiMo model procesne enote : od logičnih vrat do zbornika. V: ZAJC, Baldomir (ur.), TROST, Andrej (ur.). *Zbornik štiriindvajsete mednarodne Elektrotehniške in računalniške konference ERK 2015, 21. - 23. september 2015, Portorož, Slovenija, (Zbornik ... Elektrotehniške in računalniške konference ERK ..., ISSN 1581-4572, 24). Ljubljana: IEEE Region 8, Slovenska sekcija IEEE, 2015, zv. B, str. 143-146, ilustr.*
5. ROZMAN, Robert. Zasnova brezžičnega senzorskega omrežja na osnovi protokola SimpliCI. V: ZAJC, Baldomir (ur.), TROST, Andrej (ur.). *Zbornik enaindvajsete mednarodne Elektrotehniške in računalniške konference ERK 2012, 17.-19. september 2012, Portorož, Slovenija, (Zbornik ... Elektrotehniške in računalniške konference ERK ..., ISSN 1581-4572). Ljubljana: IEEE Region 8, Slovenska sekcija IEEE, 2012, zv. B, str. 75-78, ilustr.*

Celotna bibliografija je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=8611>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Digitalna vezja
Course title:	Digital Circuits

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program računalništva in informatike, 1. stopnja	ni smeri	2	zimski
Professional study program Computer and Information Science, 1st cycle	none	2	fall

Vrsta predmeta / Course type izbirni predmet /elective course

Univerzitetna koda predmeta / University course code: 63718

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	10	20	/	/	105	6

Nosilec predmeta / Lecturer: prof. dr. Branko Šter

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

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

Boolova algebra in osnovna matematika.

Boolean algebra and basic mathematics.

Vsebina:

1. Uvod v logična vezja
2. Signali, stikala
3. Transistorji, logične družine
4. Logična vrata in logične funkcije
5. Booleova algebra in minimizacija funkcij
6. Kombinacijska digitalna vezja
7. Sinhronska sekvenčna vezja
8. Končni avtomati
9. Programabilna digitalna vezja
10. Pomnilniki (ROM, RAM)
11. Praktični pristopi

Content (Syllabus outline):

1. Introduction to logic circuits
2. Signals, switches
3. Transistors, Logic families
4. Logic gates and functions
5. Boolean algebra and simplification
6. Combinational digital circuits
7. Synchronous sequential circuits
8. Finite automata
9. Programmable digital circuits
10. Memories (ROM, RAM)
11. Practical approaches

Temeljni literatura in viri / Readings:

1. R.H. Katz, G. Borriello, Contemporary Logic Design, Pearson, 2005
2. W.Kleitz: Digital Electronics, A practical approach, Pearson, 2005
3. J.F. Wakerly: Digital Design: Principles and Practices, Prentice-Hall, 2001

Cilji in kompetence:

Cilj predmeta je študentom računalništva in informatike podati osnovne značilnosti digitalnih vezij, ki tvorijo temeljne dele vsakega računalniškega sistema. Poleg tega je cilj podati tudi razumevanje dogajanja v računalniku na logičnem in električnem nivoju.

Kompetence:

Zmožnost razumevanja in reševanja profesionalnih izzivov v računalništvu in informatiki.

Objectives and competences:

This course aims to present to students of computer science the basic features of digital circuits, which form fundamental parts of every computer system. Moreover, the objective is also to provide an understanding of computer operation at logical and electrical level.

Competences:

The ability to understand and solve professional challenges in computer and information science.

Zmožnost uporabe pridobljenega znanja pri samostojnem delu pri reševanju tehničnih in znanstvenih problemov v računalništvu in informatiki; zmožnost nadgradnje pridobljenega znanja.

Praktično znanje in veščine, potrebne za uspešno profesionalno delo v računalništvu in informatiki.

Zmožnost samostojne izvedbe inženirskih in organizacijskih nalog v določenih ozkih področjih in samostojnega reševanja specifičnih dobro definiranih nalog v računalništvu in informatiki.

Osnovne veščine v računalništvu in informatiki, možnost nadaljevanja študija na drugi stopnji.

The ability to apply acquired knowledge in independent work for solving technical and scientific problems in computer and information science; the ability to upgrade acquired knowledge.

Practical knowledge and skills necessary for successful professional work in computer and information science.

The ability to independently perform engineering and organisational tasks in certain narrow areas and independently solve specific well-defined tasks in computer and information science.

Basic skills in computer and information science, allowing the continuation of studies in the second study cycle.

Predvideni študijski rezultati:

Znanje in razumevanje:

Poznavanje temeljnih konceptov digitalnih vezij; poznavanje električnih zakonitosti delovanja računalnika. Razumevanje pomena in uporabe digitalnih vezij in električnega ozadja pojavov v računalniku.

Uporaba:

Osnovno razumevanje električnega dogajanja v računalniku je pomembno pri načrtovanju, analizi in vrednotenju računalniških sistemov, koristno pa je za vse inženirje računalništva in informatike.

Refleksija:

Na podlagi temeljnih znanj in primerov iz prakse se pridobi sposobnost razumevanja, uporabe, vrednotenja, analize in načrtovanja digitalnih vezij v računalniških sistemih.

Prenosljive spretnosti:

Praktični pristop pri reševanju problemov nudi nadgradnjo temeljnih znanj in povezovanje problematik na sorodnih področjih.

Intended learning outcomes:

Knowledge and understanding:

Knowing the basic concepts of digital circuits; understanding the electrical basics of computer operation. Understanding the application of digital circuits and the electrical background of computer phenomena.

Application:

Basic understanding of electrical phenomena in computers is important in the design, analysis and benchmarking of computer systems. Besides, it is useful for every computer or informatics engineer.

Reflection:

Based on the basic knowledge and practical examples the student obtains the ability of understanding, usage, evaluation, analysis and design of digital circuits in computer systems.

Transferable skills:

Practical approach to problem solving provides an upgrade of the fundamental skills and integration of issues in related areas.

Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja, laboratorijske vaje, delo doma.	Courses, lab exercises, homeworks.
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Sprotno preverjanje: laboratorijske vaje, domače naloge, kolokviji	30%	Midterm assessment: laboratory exercises, homeworks, midterm exams
Končno preverjanje: pisni in teoretični izpit	35%, 35%	Final assessment: written and theoretical exam
Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).		Grading: 6-10 pass, 5 fail. (according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

1. Branko Šter: Selective recurrent neural network. *Neural processing letters*, 38(1): 1-15, 2013.
2. Dominik Olszewski, Branko Šter: Asymmetric clustering using the alpha–beta divergence. *Pattern Recognition*, 47(5): 2031-2041, 2013.
3. Rok Gaber, Tina Lebar, Andreja Majerle, Branko Šter, Andrej Dobnikar, Mojca Benčina, Roman Jerala: Designable DNA-binding domains enable construction of logic circuits in mammalian cells. *Nature Chemical Biology*, 10(3): 203-208, 2014.
4. Andrej Dobnikar, Branko Šter: Structural properties of recurrent neural networks. *Neural processing letters*, 29(2): 75-88, 2009.
5. Jernej Zupanc, Damjana Drobne, Branko Šter: Markov random field model for segmenting large populations of lipid vesicles from micrographs. *Journal of liposome research*, 21(4): 315-323, 2011.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Računalniška grafika
Course title:	Computer Graphics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	zimski
Professional study program Computer and Information Science, 1st cycle	none	2	fall

Vrsta predmeta / Course type izbirni predmet /elective course

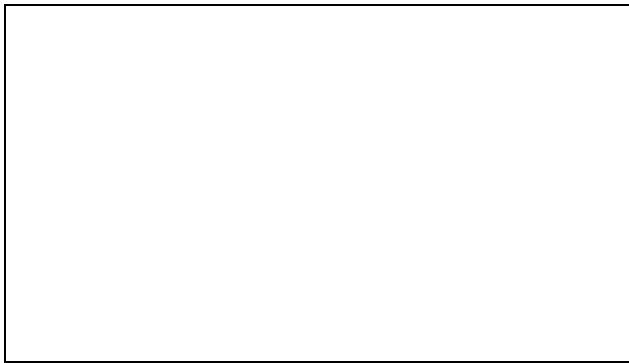
Univerzitetna koda predmeta / University course code: 63719

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	15	15	/	/	105	6

Nosilec predmeta / Lecturer: izr. prof. dr. Iztok Lebar Bajec

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

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

**Vsebina:**

- Geometrija in geometrijske metode (transformacije, koordinatni sistemi, kvaternioni, Eulerjevi koti, razdalje, standardni 3D predmeti)
- Grafični cevovod (koordinatni sistemi, perspektivna projekcija, obrezovanje in odstranjevanje odvečnih ploskev, lastnosti ploskev in oglišč, rasterizacija)
- Podatkovni modeli v računalniški grafiki (hierarhije, drevesne predstavitve, nivoji podrobnosti in njihova uporaba pri modeliranju reliefa terena)
- Teorija zaznavanja in pogleda (zaznavanje prostora, osnove kompozicije, kadri, leče)
- Teorija osvetljevanja (izvori svetlobe, osnovne komponente izvora svetlobe, osnovne pozicije svetlobnih teles, osvetlitev in razpoloženje, ...)
- Postopki upodabljanja (osvetljevanje in senčenje, sledenje žarka, sevalna metoda, ...)
- Grafični jeziki, knjižnice in produkcijska orodja
- Uvod v animacijo (pripovedovanje in načrtovanje kadrov, animacija predmetov in osebkov, ...)
- Posebni učinki in uvod v računalniško vizualizacijo (modeliranje in animacija s teksturami, bleščanje, neravnine, volumetrična megla, projicirane luči in sence, ...)

Vaje:

Laboratorijski projekt izdelave interaktivne grafične aplikacije. Na vajah podan uvod v OpenGL in samostojno delo na projektih z zaključno predstavitvijo študentov.

Content (Syllabus outline):

- Geometry and geometric methods (transformations, coordinate systems, quaternions, Euler angles, distances, standard 3D objects)
- Graphics pipeline (coordinate systems, perspective projection, clipping and culling, faces, edges, vertices, rasterisation)
- Data models in computer graphics (hierarchies, tree-like representations, levels of detail)
- Perception and view theory (depth perception, basic composition, framing scenes, lenses)
- Lighting (light sources, basic components of a light source, basic light source positions, lighting and mood, ...)
- Rendering (shading, raytracing, radiosity, ...)
- Graphics languages, libraries and production environments
- Introduction to animation (storytelling and planning scenes, animating objects and figures, ...)
- Special effects and introduction to visualization (modelling and animation with textures, lens flare, bump mapping, volumetric fog, projected light and shadows, ...)

Lab work:

Development and implementation of an interactive graphic application. An introductory course of OpenGL programming is given in the first part of the semester, followed by independent student work,

culminating with an oral presentation at the end of the semester.

Temeljni literatura in viri / Readings:

1. Saša Divjak, Matija Marolt: Računalniška grafika.
2. <http://lgm.fri.uni-lj.si/RG>.
3. Nikola Guid: Računalniška grafika. Univerza v Mariboru, FERl.
4. D. Hearn, M.P. Baker: Computer Graphics with OpenGL, Pearson Prentice Hall, NJ USA.
5. 4. D.H. Eberly: 3D Game Engine Design, Morgan Kaufman Publishers, CA USA.

Cilji in kompetence:

Cilj predmeta je študentom računalništva in informatike predstaviti programsko in algoritmično ozadje računalniške grafike in usposabljanje študentov za samostojen razvoj grafičnih aplikacij.

Študenti bodo razvijali sledeče kompetence:

- Sposobnost definiranja, razumevanja in ustvarjalnega reševanja poklicnih izzivov s področja računalništva in informatike.
- Sposobnost strokovne komunikacije tako v materinem jeziku, kot tudi tujem.
- Sposobnost prenosa znanja v pisni obliki tako v materinem jeziku, kot tudi tujem.
- Sposobnost timskega dela v strokovnem okolju; upravljanje majhne skupine strokovnjakov.
- Sposobnost prenosa znanja sodelavcem v tehnoloških in raziskovalnih skupinah.
- Praktična znanja in spretnosti iz računalniške strojne opreme, programske opreme in informacijske tehnologije, potrebne za uspešno strokovno delo na področju računalništva in informatike.
- Sposobnost samostojnega opravljanja tako manj zahtevnih kot tudi kompleksnih

Objectives and competences:

The objective is to introduce the students of computer science and informatics to the programming and algorithmic background of computer graphics and their training to become proficient developers of graphics applications.

The students will be developing the following competences:

- The ability to define, understand and solve creative professional challenges in computer and information science.
- The ability of professional communication in the native language as well as a foreign language.
- The ability of knowledge transfer and writing skills in the native language as well as a foreign language.
- The ability of teamwork within the professional environment; management of a small professional team.
- The ability to transmit knowledge to co-workers in technology and research groups.
- Practical knowledge and skills of computer hardware, software and information technology necessary for successful professional work in computer and information science.

inženirskih in organizacijskih nalog na nekaterih ozkih področjih in samostojnega reševanja določenih dobro opredeljenih nalog iz področja računalništva in informatike.

- The ability to independently perform both less demanding and complex engineering and organisational tasks in certain narrow areas and independently solve specific well-defined tasks in computer and information science.

Predvideni študijski rezultati:

Znanje in razumevanje:
 Poznavanje ozadja računalniške grafike in grafičnih algoritmov .
 Uporaba:
 Razvoj lastnih grafičnih programov, vizualizacij in animacij.
 Refleksija:
 Spoznavanje in razumevanje uglasenosti med teorijo in njeno aplikacijo na konkretnih primerih s področja računalniške grafike.
 Prenosljive spretnosti - niso vezane le na en predmet:
 Razvoj grafičnih vizualizacij na različnih strokovnih področjih.

Intended learning outcomes:

Knowledge and understanding:
 Understanding the algorithmic background of computer graphics and applications.
 Application:
 Development of graphics applications, visualisations and animations.
 Reflection:
 Concordance of theoretical and practical knowledge in the field of computer graphics.
 Transferable skills:
 Development of graphics applications (visualizations) in various areas of profession.

Metode poučevanja in učenja:

Predavanja s praktičnimi demonstracijami, izvajanje laboratorijskega projekta pod mentorstvom asistenta.

Learning and teaching methods:

Lectures with practical examples, autonomous lab work under the guidance of an assistant.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt): Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p>	<p>50%</p>	<p>Type (examination, oral, coursework, project): Continuing (homework, midterm exams, project work)</p>
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Končno preverjanje (pisni in ustni izpit) Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).	50%	Final (written and oral exam) Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

Celotna bibliografija doc. dr. Lebarja Bajca je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=8354>.

Celotna bibliografija prof. dr. Divjaka je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=4493>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Umetna inteligenca

Course title: Artificial Intelligence

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	zimski
Professional study program Computer and Information Science, 1st cycle	none	2	fall

Vrsta predmeta / Course type

izbirni predmet /elective course

Univerzitetna koda predmeta / University course code:

63720

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	6	24	/	/	105	6

Nosilec predmeta / Lecturer:

prof. dr. Igor Kononenko, prof. dr. Marko Robnik Šikonja

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

slovenščina
Slovene

slovenščina
Slovene

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

Prerequisites:

Za uspešno delo je potrebno poznavanje osnov statistike in programiranja.

Knowledge of basic statistics and programming.

Vsebina:

Predavanja

1. Kaj je inteligenca, kaj je učenje in relacija človek-stroj
2. Pregled metod strojnega učenja in osnovni principi strojnega učenja
3. Pregled preiskovalnih algoritmov
4. Ocenjevanje učenja
5. Ocenjevanje atributov
6. Odločitvena drevesa, NB in K-NN
7. Umetne nevrnske mreže
8. Reševanje problemov, hevristični preiskovalni algoritmi (A*, RBFS, minimax)
9. Predstavitev znanja, mehanizmi sklepanja ter sistemi za podporo odločanju
10. Inteligentni roboti in agentni sistemi
11. Procesiranje naravnega jezika
12. Evolucijsko računanje
13. Verjetnostno modeliranje
14. Spodbujevano učenje

Content (Syllabus outline):

Lectures

1. What is intelligence, what is learning and relation man-machine
2. Overview of machine learning (ML) methods and their basic principles
3. Overview of search algorithms
4. Evaluation of ML
5. Evaluating attributes
6. Decision trees, NB and K-NN
7. Artificial neural networks
8. Problem solving and heuristic search (A*, RBFS, minimax)
9. Knowledge representation, reasoning, decision support systems
10. Intelligent robots and agents
11. Natural language processing
12. Evolutional computation
13. Probabilistic modelling
14. Reinforcement learning

Temeljni literatura in viri / Readings:

- I. Kononenko, M. Robnik-Šikonja: *Intelligentni sistemi*, Založba FE in FRI, Ljubljana, 2010.
- I. Kononenko, M. Kukar: *Machine Learning and Data Mining*, Horwood publ., 2007.
- J. Russell, P. Norvig: *Artificial Intelligence: A Modern Approach*, 3rd edition. Prentice Hall, 2009.

Cilji in kompetence:

Cilj predmeta je študente seznaniti s temeljnimi principi in metodami umetne inteligence. Poudarek je na naboru orodij in pristopov za reševanje problemov, ki jih je težko ali nepraktično reševati z drugimi metodami. Študenti bodo teoretično znanje uporabili na realnih problemih iz znanstvenega in poslovnega okolja. Študenti morajo biti za dani problem sposobni presoje, katero od predstavljenih tehnik uporabiti, ter sestaviti prototip rešitve.

Splošne kompetence:

- razvoj spretnosti kritičnega, analitičnega in sintetičnega razmišljanja,
- sposobnost razumevanja in reševanja profesionalnih izzivov na področjih računalništva in informatike
- sposobnost profesionalne komunikacije v domačem in tujem jeziku,
- sposobnost samostojne uporabe pridobljenega znanja za reševanje tehničnih in znanstvenih problemov v računalništvu in informatiki,
- seznanjenost z raziskovalnimi metodami na področju računalništva in informatike.

Predmetno-specifične kompetence:

- uporaba osnovnih algoritmov strojnega učenja
- predpriprava podatkov za podatkovno rudarjenje
- izbira pomembnih atributov
- vrednotenje odločitvenih modelov
- uporaba sistemov za podatkovno rudarjenje
- uporaba sistemov za optimizacijo z evolucijskim računanjem
- analiza besedil s tehnikami podatkovnega rudarjenja
- uporaba orodij za spodbujevano učenje.

Objectives and competences:

The goal of the course is the students to become acquainted with the field of artificial intelligence and its methods, which includes a collection of tools and approaches for solving problems which are difficult or unpractical to tackle with other methods. Students will practically apply the theoretical knowledge on real problems from scientific and business environment. The students shall be able to decide for a given problem which of the presented techniques should be used, and to develop a prototype solution.

General competences:

- developing skills in critical, analytical and synthetic thinking,
- the ability to understand and solve professional challenges in computer and information science,
- the ability of professional communication in the native language as well as a foreign language,
- the ability to apply acquired knowledge in independent work for solving technical and scientific problems in computer and information science,
- familiarity with research methods in the field of computer science.

Subject-specific competences:

- using basic machine learning algorithms
- preprocessing data for data mining
- feature subset selection
- evaluation of decision models
- using data mining systems
- using optimizations packages with evolutionary techniques
- text analysis and text mining
- using reinforcement learning tools

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

Znanje in razumevanje:

Poznavanje različnih tehnik in metod, ki se uporabljajo na področju umetne inteligence. Sposobnost za analizo, sintezo in predvidevanje rešitev ter njihovih posledic na konkretnih problemih z uporabo znanstvenih metod.

Uporaba:

Uporaba predstavljenih metod na konkretnih problemih iz znanstvenega in poslovnega okolja. Poznavanje in uporaba orodij s področja umetne inteligence.

Refleksija:

Spoznavanje in razumevanje pomena temeljnega matematičnega in statističnega znanja, uglasenosti med teorijo in njeno aplikacijo na konkretnih primerih s področja umetne inteligence in inteligentnega modeliranja. Avtonomnost, (samo)kritičnost, (samo)refleksivnost, prizadevanje za kakovost.

Prenosljive spretnosti - niso vezane le na en predmet:

Prenos naučenih principov na načrtovanje drugih sistemov, kjer lahko principi inteligentnih rešitev pomagajo izboljšati uporabnost in uspešnost sistema.

Sposobnost pridobivanja, selekcije in ocenjevanja novih informacij in zmožnost ustrezne interpretacije v kontekstu.

Sposobnost za upravljanje s časom, za samo pripravo in načrtovanje ter samokontrolo izvajanja načrtov in postopkov.

Timsko delo, pisanje poročil in predstavljanje.

Koherentno obvladanje temeljnega znanja, pridobljenega pri obveznih predmetih, ter sposobnost povezovanja znanja z različnih področij in njegova uporaba v praksi.

Knowledge and understanding:

Expertise in several techniques and methods, used in the field of artificial intelligence. The ability for analysis, synthesis and anticipation of solutions and their consequences for target problems using the scientific methodology.

Application:

The use of the presented methods on target problems from scientific and business environment. The understanding and usage of tools in the field of artificial intelligence.

Reflection:

The recognition and understanding of the meaning of basic mathematical and statistical knowledge, the relation between theory and its application in concrete examples of intelligent modelling and artificial intelligence. Autonomy, (self) criticalness, (self) reflexivity, aspiration for quality.

Transferable skills:

The transfer of the learned principles for planning of large systems where the principles of artificial intelligent solutions help to improve the usability and the system performance. The ability to receive, select and evaluate new information and proper interpretation in a context. A self-control and ability to manage limited time when preparing, planning and implementing plans and processes. Team work, writing of reports and papers, public presentations.

Coherent mastering of basic knowledge, gained through mandatory courses, and the ability to combine the knowledge from different fields and to apply it in practice.

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

Predavanja, vaje z ustnimi nastopi in predstavitevami, seminarski način dela pri domačih nalogah. Študenti bodo v manjših skupinah samostojno reševali realen problem. Skupine bodo svoje naloge in rešitve opisale v pisnem poročilu in predstavile ostalim v obliki kratke predstavitve, ki je ocenjena skupaj s poročilom.

Lectures, assignments with written and oral demonstrations and presentations, seminar works and homework. Students from small project teams and autonomously solve assignments based on real-life problems. The teams describe their solutions in written reports and prepare short oral presentations. Written reports and oral presentations are graded.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način: pisni in ustni izpit, naloge, projekt.</p> <p>Sprotno preverjanje: domače naloge, kolokviji in projektno delo.</p> <p>Končno preverjanje: pisni in ustni izpit.</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type: written and oral exam, coursework, project.</p> <p>Continuing: homework, project work.</p> <p>Final: written and oral exam.</p> <p>Grading: 6-10 pass, 1-5 fail (according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del/ Five most important works:

KONONENKO Igor:

1. KONONENKO, Igor, KUKAR, Matjaž. Machine learning and data mining: introduction to principles and algorithms. Chichester: Horwood Publishing, cop. 2007
2. ŠTRUMBELJ, Erik, KONONENKO, Igor. An efficient explanation of individual classifications using game theory. J. mach. learn. res., Jan. 2010, vol. 11, no. [1], str. 1-18.
3. ROBNIK ŠIKONJA, Marko, KONONENKO, Igor. Theoretical and empirical analysis of ReliefF and RReliefF. Mach. learn., 2003, vol. 53, str. 23-69.
4. KONONENKO, Igor, BRATKO, Ivan. Information-based evaluation criterion for classifier's performance. Mach. learn., 1991, vol. 6, no. 1, str. 67-80.
5. KONONENKO, Igor. Machine learning for medical diagnosis: history, state of the art and perspective. Artif. intell. med., 2001, vol. 23, no. 1, str. 89-109.

Celotna bibliografija prof. dr. Kononenka je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=5066>.

Complete bibliography is available in SICRIS:

<http://sicris.izum.si/search/rsr.aspx?lang=eng&id=5066>.

ROBNIK-ŠIKONJA Marko:

1. ROBNIK ŠIKONJA, Marko. Data generators for learning systems based on RBF networks. *IEEE transactions on neural networks and learning systems*, May 2016, vol. 27, no. 5, pp. 926-938.

2. PIČULIN, Matej, ROBNIK ŠIKONJA, Marko. Handling numeric attributes with ant colony based classifier for medical decision making. *Expert systems with applications*, Nov. 2014, vol. 41, no. 16, pp. 7524-7535.
3. ROBNIK ŠIKONJA, Marko, VANHOOF, Koen. Evaluation of ordinal attributes at value level. *Data mining and knowledge discovery*, 2007, vol. 14, no. 2, str. 225-243.
4. ROBNIK ŠIKONJA, Marko, KONONENKO, Igor. Theoretical and empirical analysis of ReliefF and RReliefF. *Machine learning*, 2003, 53:23-69.
5. ROBNIK ŠIKONJA, Marko, KONONENKO, Igor. Explaining classifications for individual instances. *IEEE Transactions on Knowledge and Data Engineering*, 2008, 20(5):589-600.

Celotna bibliografija je dostopna na SICRISu <http://sicris.izum.si/search/rsr.aspx?lang=slv&id=8741>.

Complete bibliography is available in SICRIS:

<http://sicris.izum.si/search/rsr.aspx?lang=eng&id=8741>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS						
Predmet:	Uporabniški vmesniki					
Course title:	User Interfaces					
Študijski program in stopnja Study programme and level	Študijska smer Study field		Letnik Academic year	Semester Semester		
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri		2	poletni		
Interdisciplinarni univerzitetni študijski program Upravna informatika prve stopnje	none		2	spring		
Professional study program Computer and Information Science, 1st cycle	none		2	spring		
Interdisciplinary university study programme in Administrative Informatics 1 st cycle	none		2	spring		
Vrsta predmeta / Course type			RI: izbirni predmet / CIS: elective course UI: obvezni predmet / AI: compulsory course			
Univerzitetna koda predmeta / University course code:			63721			
Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6
Nosilec predmeta / Lecturer: doc. dr. Jure Žabkar						
Jeziki / Languages: Predavanja / Lectures: slovenščina Slovene						

	Vaje / Tutorial:	slovenščina Slovene
Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:		Prerequisites:
Vsebina:		Content (Syllabus outline):
<p>Predavanja:</p> <ol style="list-style-type: none"> 1. Programska arhitektura uporabniških vmesnikov (dogodkovni interaktivni vmesniki). 2. Orodja za načrtovanje uporabniških vmesnikov (Qt Quick designer, QML). 3. Gradnja uporabniških vmesnikov. 4. Dogodkovno vodeno programiranje. 5. Uporabnost. 6. Uporabniško usmerjeno načrtovanje; uporabniška izkušnja. 7. Sposobnosti človeka. 8. Principi načrtovanja. 9. Navodila načrtovanja: izbor naprav za interakcijo; načrtovanje grafičnega dela uporabniškega vmesnika (tekst, barve, slike, animacije); povratne informacije. 10. Principi in navodila za načrtovanje mobilnih aplikacij. 11. Principi in navodila za načrtovanje spletnih strani. 12. Inteligentni uporabniški vmesniki 13. Interakcija človek-robot. 14. Papirnati prototipi. 15. Računalniški prototipi. 16. Izhodni modeli. 17. Načrtovanje ikon 		<p>Lectures:</p> <ol style="list-style-type: none"> 1. User interface software architecture (event oriented interactive interfaces). 2. Toolkits for designing user interfaces (Qt Quick designer, QML). 3. Building user interfaces. 4. Event-oriented programming. 5. Usability. 6. User-centered design; user experience design. 7. Human capabilities. 8. Design principles. 9. Design guidelines: choosing interaction devices; GUI design (text, colors, images, animations); user feedback. 10. Principles and guidelines for designing mobile applications. 11. Principles and guidelines for designing Web pages. 12. Intelligent user interface design 13. Human-robot interaction 14. Paper prototyping. 15. Computer prototyping. 16. Output models. 17. Designing icons. 18. Heuristic evaluation. 19. User testing.

<p>18. Hevristično vrednotenje. 19. Testiranje uporabnikov.</p> <p>Vaje:</p> <ol style="list-style-type: none"> 1. Utrjevanje pri predavanjih obravnavane snovi s primeri. 2. Predstavitev tipičnih aspektov načrtovanja uporabniških vmesnikov oziroma aplikacij. <p>Domače naloge:</p> <ol style="list-style-type: none"> 1. Študentje izdelajo od 4 do 6 projektov in jih zagovarjajo učitelju. Te projekte lahko študentje opravljajo tudi pri vajah ob pomoči učitelja. 	<p>Practical work:</p> <ol style="list-style-type: none"> 1. Strengthening of topics from lectures with examples. 2. Representing typical aspects of user interface design and applications. <p>Homeworks:</p> <ol style="list-style-type: none"> 1. Students derive from 4 to 6 projects or applications and present them to the teacher. These projects can be derived at laboratory work under teacher supervision.
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Temeljna literatura in viri / Readings:

1. Stone, Jarett, Woodroffe, Minocha: *User Interface Design and Evaluation*, 2005, Morgan Kaufmann.
2. Schneiderman, Plaisant: *Designing the User Interface; Strategies for Effective Human-Computer Interaction*, (5th edition), 2010, Addison Wesley.
3. Norman D A: *The Design of Everyday Things*, 2002, Basic Books.
4. Benyon, *Designing Interactive Systems; A comprehensive guide to HCI and interaction design*, 2010, Addison Wesley.
5. W. O. Galitz: *It is Time to Clean Your Windows; Designing GUIs That Work*, 1994, John Wiley & Sons, Inc.
6. R. W. Sebesta: *Programming the World Wide Web* (8th edition), 2015, Pearson Education Inc.

Cilji in kompetence:

Cilj predmeta je podati splošen uvod v področje uporabniških vmesnikov in interaktivnih aplikacij. Študentje naj razumejo širok razpon osnovnih konceptov področja in so sposobni uporabiti osnovne principe, navodila in tehnike za načrtovanje uporabniških vmesnikov in interaktivnih aplikacij. Uporabniške vmesnike naj bodo sposobni analizirati in ovrednotiti njihovo uporabnost.

Objectives and competences:

The goal of the subject is to give common introduction into the field of user interfaces and interactive applications. Students should understand a wide range of basic concepts of the field and should be able to use basic principles, guidelines and designing techniques to design user interfaces or interactive applications, to analyse and to evaluate their usability.

Predvideni študijski rezultati:

Intended learning outcomes:

Znanje in razumevanje:

Poznavanje osnovnih konceptov komunikacije človek računalnik in človek robot; poznavanje konceptov interakcije; poznavanje principov, navodil in postopkov načrtovanja uporabniških vmesnikov; poznavanje postopkov vrednotenja uporabniških vmesnikov in vrednotenja njihove uporabnosti.

Uporaba:

Uporaba znanj s področja komunikacije med človekom in računalnikom pri načrtovanju in vrednotenju uporabniških vmesnikov oziroma interaktivnih aplikacij.

Refleksija:

Pridobitev lastnih izkušenj o dobrih in slabih vmesnikih z ozirom na splošno sprejeta navodila in standarde tega področja. Pridobitev kritičnega odnosa do načrtovanja vmesnikov in interakcije. Znanje o dobro in slabo načrtanih uporabniških vmesnikih,

skupaj z znanjem principov interakcije in navodil omogoča jasno razumevanje o tem, kaj je narobe z vmesnikom, kako interakcijo lahko izboljšamo in kako razviti boljši vmesnik.

Prenosljive spretnosti - niso vezane le na en predmet:

Znanja tega predmeta se ne omejujejo le na načrtovanje uporabniških vmesnikov, pač pa vključujejo tudi študije ljudi in računalniških tehnologij ter medsebojne vplive. Področje je večdisciplinarno in povezuje tudi nekatere elemente analize sistemov, razvoja programske opreme, računalniške grafike, umetne inteligence, kognitivnih znanosti, psihologije, sociologije, načrtovanja in ergonomije.

Knowledge and understanding:

Knowing basic concepts of human-computer and human-robot interaction; knowing concepts of interactions; knowing principles, guidelines and procedures of user interface design; knowing user interface evaluation procedures;

and evaluation of their usability.

Application:

Use of knowledge of the field of human-computer interaction at designing and evaluating user interfaces or interactive applications.

Reflection:

Acquiring skills about good and bad user interfaces with regard to commonly accepted guidelines and standards of the field. Adopting critical attitude in designing interfaces and interactions. Knowledge about goodly and badly designed user interfaces, together with knowledge about principles of interactions and guidelines clearly allow understanding about what is wrong with the interface, how the interaction can be improved and how to design better interface.

Transferable skills – not connected to one subject only:

Knowledge of this subject is not connected to user interface design only but includes also studies of human and computer technologies, and how they interfere with each other. The field is multidisciplinary field and also connects certain elements of system analysis, development of software, computer graphics, artificial intelligence, cognitive sciences, psychology, sociology, designing and ergonomics.

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

Predavanja, vaje z ustnimi zagovori, domače naloge. Poseben poudarek je na sprotnem študiju in na samostojnem delu pri vajah in domačih nalogah.	Lectures, practical work with oral defence, homeworks. Special emphasis on continuous and prompt study, and independent practical work and homeworks.
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):		Type (examination, oral, coursework, project):
Sprotno preverjanje (domače naloge, kolokviji in projektno delo)	50%	Continuing (homework, midterm exams, project work)
Končno preverjanje (pisni in ustni izpit)	50%	Final (written and oral exam)
Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).		Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

[1] ŽABKAR, Jure, LEONARDIS, Aleš. Motor memory : representation, learning and consolidation. *Biologically inspired cognitive architectures*, ISSN 2212-683X, Apr. 2016, vol. 16, str. 64-74.

[2] ŽABKAR, Jure, BRATKO, Ivan, DEMŠAR, Janez. Extracting qualitative relations from categorical data. *Artificial intelligence*, ISSN 0004-3702. [Print ed.], Oct. 2016, vol. 239, str. 54-69.

[3] ŽABKAR, Jure, MOŽINA, Martin, BRATKO, Ivan, DEMŠAR, Janez. Learning qualitative models from numerical data. *Artificial intelligence*, ISSN 0004-3702. [Print ed.], 2011, vol. 175, no. 9/10, str. 1604-1619.

[4] MOŽINA, Martin, ŽABKAR, Jure, BRATKO, Ivan. Argument based machine learning. *Artificial intelligence*, ISSN 0004-3702. [Print ed.], 2007, vol. 171, no. 10/15, str. 922-937.

[5] SADIKOV, Aleksander, GROZNIK, Vida, ŽABKAR, Jure, MOŽINA, Martin, GEORGIEV, Dejan, PIRTOŠEK, Zvezdan, BRATKO, Ivan. ParkinsonCheck smart phone app. V: SCHAUB, Torsten (ur.), FRIEDRICH, Gerhard (ur.), O'SULLIVAN, Barry (ur.). *ECAI 2014 : proceedings*, (Frontiers in artificial intelligence and applications (Print), ISSN 0922-6389, vol. 263). Amsterdam [etc.]: IOS Press, cop. 2014, str. 1213-1214.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Prevajalniki in navidezni stroji

Course title: Compilers and Virtual Machines

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	poletni
Professional study program Computer and Information Science, 1st cycle	none	2	spring

Vrsta predmeta / Course type

izbirni predmet /elective course

Univerzitetna koda predmeta / University course code:

63722

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer:

doc. dr. Boštjan Slivnik

Jeziki /

Languages:

Predavanja / Lectures:

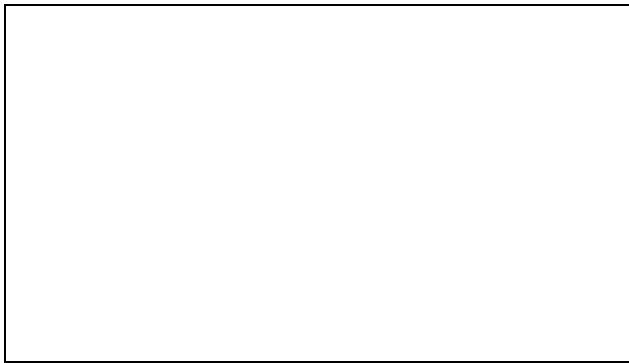
Vaje / Tutorial:

slovenščina
Slovene

slovenščina
Slovene

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

Prerequisites:

**Vsebina:**

- Uvod:
razbitje prevajalnika na prednji in zadnji del;
izbira prevajanega programskega jezika in ciljnega navideznega stroja.
- Leksikalna analiza:
opis simbolov programskega jezika z regularnimi izrazi;
domača naloga: izdelava leksikalnega analizatorja.
- Sintaksna analiza:
opis sintakse s kontekstno neodvisno gramatiko;
domača naloga: izdelava sintaksnega analizatorja.
- Abstraktna sintaksa:
poenostavljena interna predstavitev prevajanega programa;
domača naloga: generiranje abstraktnega sintaksnega drevesa prevajanega programa.
- Semantična analiza:
analiza podatkovnih tipov;
domača naloga: izdelava semantičnega analizatorja za preverjanje tipov.
- Navidezni stroji:
registrski in skladovni navidezni stroji, uporaba podprogramov, ki so napisani v strojni kodi.
- Klicni zapisi:
klicni zapisi za aktivacijo podprogramov, sklad za realizacijo klicnih zapisov;
domača naloga: načrt klicnih zapisov.
- Koda navideznega stroja:
prevod v kodo skladovnega navideznega stroja;

Content (Syllabus outline):

- Introduction:
separation of the compiler's front end and back end;
selection of the compiled language and the target virtual machine.
- Lexical analysis:
description of basic language symbols with regular expressions;
homework: lexical analyzer.
- Syntax analysis:
syntax description using context-free grammars, and parsing;
homework: syntax analyzer.
- Abstract syntax:
abstract syntax trees as internal representation of the compiled program;
homework: construction of the abstract syntax tree for the source program.
- Semantic analysis:
type checking;
homework: semantic analyzer for type checking.
- Virtual machines:
register-based and stack-based virtual machines, native interface.
- Activation records:
activation records, heap or stack based implementation;
homework: activation records for the source program.
- Virtual machine code:
code generation for stack-based virtual machines;
homework: code generator for the stack-based virtual machine.

<p>domača naloga: izdelava generatorja kode skladovnega navidezne stroja.</p> <ul style="list-style-type: none"> • Prevajanje kode skladovnega navidezne stroja: način prevajanja skladovne kode v registrsko kodo, uporaba sprotnega prevajanja (<i>just-in-time</i>) vmesne kode v strojno kodo. • Zaključek. 	<ul style="list-style-type: none"> • Compiling stack-based to register-base virtual machine code: techniques for just-in-time compilation of stack-based virtual machine code. • Conclusion.
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Temeljna literatura in viri / Readings:

<ol style="list-style-type: none"> 1. Andrew W. Appel, <i>Modern Compiler Implementation in Java</i>, Cambridge University Press, 2002. 2. Boštjan Vilfan, <i>Prevajanje programskih jezikov</i>, 1. del, Fakulteta za elektrotehniko in računalništvo, 1991. 3. <u>Steven Muchnick</u>, <i>Advanced Compiler Design and Implementation</i>, Morgan Kaufmann, 1997.
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Cilji in kompetence:

<p>Predstavitev zgradbe, delovanja in izdelave prevajalnika za prevajanje programskih jezikov v jezike navidezne strojev; predstavitev zgradbe in delovanja navidezne strojev.</p> <p>Splošne kompetence:</p> <ul style="list-style-type: none"> • Sposobnost razumevanja in reševanja strokovnih izzivov v računalništvu in informatiki • Sposobnost definiranja, razumevanja in reševanja strokovnih izzivov v računalništvu in informatiki • Sposobnost uporabe pridobljenega znanja pri samostojnem reševanju tehničnih in znanstvenih problemov v računalništvu in informatiki; sposobnost razširjanja pridobljenega znanja <p>Predmetno-specifične kompetence:</p> <ul style="list-style-type: none"> • Praktično znanje in veščine s področja strojev in programske opreme ter informacijske tehnologije, ki so potrebne za uspešno strokovno delo v računalništvu in informatiki • Sposobnost samostojnega izvajanja enostavnih in zahtevnih opravil v določenih ožjih področjih in samostojno reševanje specifičnih dobro

Objectives and competences:

<p>Introduction to compilers and virtual machines; the theory and practice of compiling programming languages to virtual machine code; introduction to the design and implementation of virtual machines.</p> <p>General competences:</p> <ul style="list-style-type: none"> • The ability to understand and solve professional challenges in computer and information science • The ability to define, understand and solve creative professional challenges in computer and information science; • The ability to apply acquired knowledge in independent work for solving technical and scientific problems in computer and information science; the ability to upgrade acquired knowledge <p>Subject-specific competences:</p> <ul style="list-style-type: none"> • Practical knowledge and skills of computer hardware, software and information technology necessary for successful professional work in computer and information science • The ability to independently perform both less demanding and complex engineering and organisational tasks in certain narrow areas and
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definiranih opravil v računalništvu in informatiki

- Osnovne veščine v računalništvu in informatiki, ki omogočajo nadaljevanje študija na drugi stopnji

independently solve specific well-defined tasks in computer and information science

- Basic skills in computer and information science, allowing the continuation of studies in the second study cycle

Predvideni študijski rezultati:

Znanje in razumevanje:

Razumevanje delovanja prevajalnika: poznavanje algoritmov za sintaksno in semantično analizo programov ter algoritmov za generiranje vmesne in strojne kode; poznavanje omejitev prevajalnikov.

Poznavanje delovanja prevedenih programov.

Uporaba:

Prevajalnik je osnovno orodje pri razvoju programske opreme, zato se pridobljeno znanje avtomatsko uporablja pri vsakem programiranju.

Refleksija:

Spoznavanje in razumevanje odnosa med programiranjem in izvajanjem programov.

Prenosljive spretnosti - niso vezane le na en predmet:

Algoritmi za analizo strukturiranih besedil, pisanje učinkovito kodiranih programov.

Intended learning outcomes:

Knowledge and understanding:

Understanding the principles of compilation: understanding the algorithms for syntax and semantic analysis, and for code generation; understanding the limitations of compilers.

Application:

As the compiler is the most basic tool of every software engineer, the knowledge gained at this course is used at every programming project.

Reflection:

Understanding the relation between programming and execution of compiled programs.

Transferable skills:

Algorithms for the analysis of structured documents, skills for writing effective code.

Metode poučevanja in učenja:

Predavanja in domače naloge (seminarski način dela). Poseben poudarek je na sprotnem oddajanju domačih nalog.

Learning and teaching methods:

Lectures and tutorials, with a special emphasis on doing homeworks on time.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homeworks)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail</p> <p>(according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

1. SLIVNIK, Boštjan. LL conflict resolution using the embedded left LR parser. Computer Science and Information Systems, 2012, vol. 9, no. 3, str. 1105-1124.
2. POTOČNIK, Matic, ČIBEJ, Uroš, SLIVNIK, Boštjan. Linter - a tool for finding bugs and potential problems in Scala code. V: Proceedings of the 29th Annual ACM Symposium on Applied Computing, Gyeongju, Korea, March 24-28, 2014. Proceedings of the 29th Annual ACM Symposium on Applied Computing, Gyeongju, Korea, March 24-28, 2014. [S. l.]: Association for Computing Machinery, cop. 2014, str. 1615-1616, graf. prikazi. [COBISS.SI-ID 10520660]
3. SLIVNIK, Boštjan. LLLR parsing. V: Proceedings of the 28th annual ACM Symposium on Applied Computing 2013, Coimbra, Portugal, March 18-22. [S. l.]: Association for Computing Machinery, 2013, str. 1698-1699. [COBISS.SI-ID 9735508]
4. SLIVNIK, Boštjan. The embedded left LR parser. V: GANZHA, Maria (ur.), MACIASZEK, Leszek (ur.), PAPRZYCKI, Marcin (ur.). FedCSIS : proceedings of the Federated Conference on Computer Science and Information Systems, September 18-21, 2011, Szczecin, Poland. Los Alamitos: IEEE Computer Society Press, 2011, str. 871-878, graf. prikazi. [COBISS.SI-ID 8628564]
5. SLIVNIK, Boštjan, VILFAN, Boštjan. Producing the left parse during bottom-up parsing. Inf. process. lett.. [Print ed.], Dec. 2005, vol. 96, no. 6, str. [220]-224. [COBISS.SI-ID 5075284]
6. SLIVNIK, Boštjan, VILFAN, Boštjan. Improved error recovery in generated LR parsers. Informatica (Ljublj.), 2004, vol. 28, no. 3, str. 257-263, ilustr. [COBISS.SI-ID 4902484]

Celotna bibliografija je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=7849>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Testiranje in kakovost

Course title: Testing and quality

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	poletni
Interdisciplinarni univerzitetni študijski program prve stopnje Upravna informatika		3	
Professional study program Computer and Information Science, 1st cycle	none	2	spring
Interdisciplinary university Study Programme in Administrative Informatics 1 st Cycle		3	

Vrsta predmeta / Course type

izbirni predmet / elective course
obvezni predmet / compulsory course

Univerzitetna koda predmeta / University course code:

63724

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer:

viš. pred. dr. Igor Rožanc

Jeziki /

Predavanja / Lectures:

slovenščina
Slovene

Languages:

Vaje / Tutorial: slovenščina
Slovene

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

Poznavanje osnov diskretnih struktur, programiranja ter osnov algoritmov in podatkovnih struktur.

Prerequisites:

Knowledge of basic discrete structures, programming and algorithms and data structures.

Vsebina:

Vsebina predmeta:

A) Testiranje programske opreme

1. Uvod v testiranje PO: programske napake in odpovedi, principi testiranja, planiranje testiranja, testiranje sistema, avtomatsko testiranje, dokumentiranje testiranja
2. Modelno vodeno načrtovanje testiranja
3. Testiranje z uporabo kriterija pokritja grafov
4. Testiranje z uporabo kriterija pokritja programske logike
5. Testiranje z uporabo kriterija pokritja delitve testnih podatkov
6. Testiranje z uporabo kriterija pokritja sintakse
7. Pregled pokritij testiranja
8. Testiranje specifičnih tehnologij
9. Orodja za testiranje

B) Kakovost programske opreme

1. Uvod v kakovost programske opreme
2. Modeli in standardi: modeli kakovosti, ISO modeli in standardi, zmožnostno-zrelostni model (CMMI)
3. Skupinski in osebni proces razvoja PO (TSP in PSP)
4. Metrike programske opreme

Content (Syllabus outline):

Lecture topics:

A) Software testing

1. Introduction to software testing: Software defects and failures, testing principles, test planning, system testing, automated testing, testing documentation
2. Model-Driven Test Design
3. Testing using graph coverage criteria
4. Testing using logic coverage criteria
5. Input space partition coverage testing
6. Testing using syntax coverage criteria
7. Testing coverage summary
8. Testing of specific technologies
9. Testing tools

B) Software quality

1. Introduction to software quality
2. Models and standards: quality models, ISO standards and models, Capability Maturity Models (CMMI)
3. Team software process (TSP)
4. Personal software process (PSP)
5. Software metrics

Temeljni literatura in viri / Readings:

1. P.Ammann, J.Offutt: *Introduction to Software Testing*, Cambridge University Press, 2008.
2. S.H.Kan: *Metrics and Models in Software Quality Engineering, 2nd Edition*, Addison Wesley, 2002.
3. N. Fenton, S. L. Pfleeger: *Software Metrics, A Rigorous and Practical Approach*, PWS Publishing Company, 1997.

Dodatna literatura je na razpolago v obliki znanstvenih in strokovnih člankov.

Additional literature is available in the form of scientific and professional papers.

Cilji in kompetence:

Cilj predmeta je študente seznaniti s različnimi pristopi pri testiranju programske opreme ter modeli in standardi na področju kakovosti programske opreme. Poudarek je na pridobitvi znanja za praktično uporabo testnih orodij ter uporabo ustreznih pristopov za zagotavljanje kakovosti programske opreme.

Splošne kompetence:

- sposobnost kritičnega razmišljanja,
- razvoj sposobnosti kritičnega, analitičnega in sinteznega razmišljanja,
- sposobnost definiranja, razumevanja in reševanja ustvarjalnih profesionalnih izzivov,
- sposobnost profesionalne komunikacije v domačem in tujem jeziku,
- sposobnost uporabe pridobljenega znanja pri samostojnem delu pri reševanju tehničnih in znanstvenih problemov; sposobnost nadgradnje pridobljenega znanja.

Predmetno-specifične kompetence:

- poznavanje temeljnih pojmov na področju testiranja programske opreme,
- uporaba modelno vodenega načrtovanja testiranja
- uporaba različnih kriterijev za učinkovito testiranje programske opreme: z uporabo pokritij grafov, programske logike, delitve testnih podatkov ter sintakse,
- poznavanje posebnosti testiranja specifičnih tehnologij,
- uporaba osnovnih orodij za testiranje,

Objectives and competences:

The objective of the course is the students to become acquainted with different software testing approaches, and models and standards in the field of software quality. The emphasis is on the acquisition of knowledge for practical use of testing tools, and the use of efficient approaches for software quality assurance.

General competences:

- ability of critical thinking,
- developing skills in critical, analytical and synthetic thinking,
- the ability to define, understand and solve creative professional challenges,
- the ability of professional communication in the native language as well as a foreign language,
- the ability to apply acquired knowledge in independent work for solving technical and scientific; the ability to upgrade acquired knowledge.

Subject-specific competences:

- knowledge of basic terminology in the field of software testing,
- use of model-driven test design,
- use of different criteria for effective testing: using graph, program logic, input space partition and syntax coverage,
- knowledge of specific technologies testing specifics,
- use of basic testing tools,
- knowledge of basic terminology in the field of software quality,
- knowledge of main models and standards for software quality assurance (ISO, CMMI),

- poznavanje osnovnih pojmov na področju kakovosti programske opreme,
- poznavanje glavnih modelov in standardov za zagotavljanje kakovosti programske opreme (ISO, CMMI),
- uporabo pristopa za zagotavljanje kakovosti programske opreme pri individualnem delu,
- poznavanje osnovne terminologije na področju metrik programske opreme.

- use of software quality assurance approach for individual use,
- knowledge of basic terminology in the field of software metrics.

Predvideni študijski rezultati:

Intended learning outcomes:

Znanje in razumevanje:
 Poznavanje in razumevanje značilnosti različnih vrst testiranja programske opreme; poznavanje modelno vodenega testiranja in različnih kriterijev pokritij programskih modelov; praktično razumevanje pomena discipliniranega procesa in uporabe standardov/modelov za zagotavljanje kakovosti razvoja programske opreme; , poznavanje osnovnih pojmov na področju metrik programske opreme.

Uporaba:
 Praktična znanja in prijemi pri testiranju programske opreme, praktična znanja o metrikah programske opreme, poznavanje glavnih značilnosti procesa, ki zagotavlja kakovost programske opreme.

Refleksija:
 V praksi je testiranje pomemben del razvoja programske opreme, ki se mu pogosto ne pripisuje ustreznega pomena. Podobno velja za zagotavljanje kakovosti. Poznavanje pravih prijemov in možnosti ustrezno pouči o izbiri v konkretnem primeru.

Prenosljive spretnosti - niso vezane le na en predmet:
 Konkretna znanja s področja testiranja, poznavanje prijemov s področja zagotavljanja kakovosti, še zlasti metrik in modelov.
 Sposobnost za upravljanje s časom, za samo pripravo in načrtovanje ter samokontrolo izvajanja načrtov in postopkov.

Knowledge and understanding:
 Understanding and knowledge of the properties of different types of software testing; knowledge of model-driven testing design and different testing coverage criteria; practical understanding of the meaning of disciplined process and usage of standards/models for software development quality assurance; knowledge the basic terminology in the field of software metrics.

Application:
 Practical knowledge and approaches in software testing, practical knowledge of software metrics and properties of software quality assurance process.

Reflection:
 Software testing presents the important part of software development process, despite the fact that its importance is often neglected. Similarly, this is also true for quality assurance. Having the theoretical and practical knowledge about the approaches and possibilities increases the acceptance rate of described methods, thus increases the quality of software.

Transferable skills – are not bound only to this course:
 Practical knowledge in the field of software testing, practical knowledge of the quality assurance approaches, particularly metrics and models.
 A self-control and ability to manage limited time when preparing, planning and implementing plans

Timsko delo, pisanje poročil, javne predstavitve rezultatov.

Koherentno obvladanje temeljnega znanja, pridobljenega pri obveznih predmetih, ter sposobnost povezovanja znanja z različnih področij in njegova uporaba v praksi.

and processes. Team work, writing of reports, public presentations of the results.

Coherent mastering of basic knowledge, gained through mandatory courses, and the ability to combine the knowledge from different fields and apply it in practice.

Metode poučevanja in učenja:

Learning and teaching methods:

Klasična predavanja s predstavitvijo praktičnih izkušenj. Sprotno učenje spodbujamo na vajah z večjim številom domačih nalog ter nekaj seminarских nalog, ki zahtevajo tako uporabo testnih prijemov kot modela za zagotavljanje kakovosti. Študentje za vsako oddajo poročilo o rezultatih testiranja ter poročila o postopku uporabe PSP-ja. Pri delu študentje spoznajo več različnih testnih orodij.

Classic lectures that include the presentation of best practices. During exercises continuous study is enhanced by several home assignments and a few seminars. The latter demand the use of testing approaches and model for software quality assurance. For each seminar the students hand in report on testing results as well as PSP reports. Students get familiar with several testing tools.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način: pisni in (po potrebi) ustni izpit, domače naloge, seminarske naloge, poročila.</p> <p>Sprotno preverjanje: domače in seminarske naloge.</p> <p>Končno preverjanje: pisni in (po potrebi) ustni izpit.</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50 %</p> <p>50 %</p>	<p>Type: oral (optional) and written examination, home assignments, seminars, reports.</p> <p>Continuing: home assignments and seminars.</p> <p>Final: written and oral exam.</p> <p>Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

1. ROŽANC, Igor, MAHNIČ, Viljan. Poučevanje kakovosti programske opreme s poudarkom na modelu PSP. V: RAJKOVIČ, Vladislav (ur.), URBANČIČ, Tanja (ur.), BERNIK, Mojca (ur.). *Vzgoja in izobraževanje v informacijski družbi*, (Organizacija, Letn. 38, 2005, št. 8). Kranj: Moderna organizacija, 2005, str. 454-464, ilustr. [COBISS.SI-ID [16019686](#)]
2. MAHNIČ, Viljan, ROŽANC, Igor. Data quality : a prerequisite for successful data warehouse implementation. *Informatica (Ljublj.)*, 2001, vol. 25, no. 2, str. 183-188. [COBISS.SI-ID [2424148](#)]
3. ROŽANC, Igor, MAHNIČ, Viljan. Uporaba modela CMM v majhnih organizacijah za razvoj programske opreme. *Elektrotehniški vestnik*. [Slovenska tiskana izd.], 2003, letn. 70, št. 3, str. 149-154, ilustr. [COBISS.SI-ID [3804756](#)]
4. ROŽANC, Igor, SLIVNIK, Boštjan. Using reverse engineering to construct the platform independent model of a web application for student information systems. *Computer Science and Information Systems*, ISSN 1820-0214, 2013, vol. 10, no. 4, str. 1557-1583, ilustr. [COBISS.SI-ID [10226516](#)]
5. ROŽANC, Igor, SLIVNIK, Boštjan. Using reverse engineering to construct the platform independent model of a web application for student information systems. *Computer Science and Information Systems*, ISSN 1820-0214, 2013, vol. 10, no. 4, str. 1557-1583. [COBISS.SI-ID [10226516](#)]

Celotna bibliografija viš. pred. dr. Rožanca je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=8113>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Razvoj informacijskih sistemov

Course title: Information Systems Development

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	poletni
Professional study program Computer and Information Science, 1st cycle	none	2	spring

Vrsta predmeta / Course type

izbirni predmet /elective course

Univerzitetna koda predmeta / University course code:

63725

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	10	20	/	/	105	6

Nosilec predmeta / Lecturer:

doc. dr. Damjan Vavpotič

Jeziki /

Predavanja / Lectures:

slovenščina
Slovene

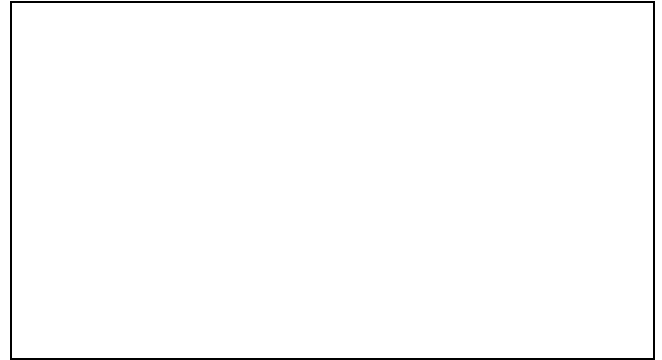
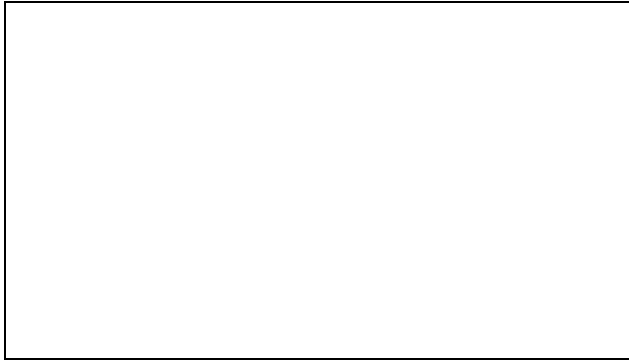
Languages:

Vaje / Tutorial:

slovenščina
Slovene

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

Prerequisites:

**Vsebina:**

1. Osnovni koncepti razvoja IS
2. Principi strukturnega in objektnega razvoja
3. Zajem zahtev za IS
4. Analiza IS (objektni z uporabo UML in strukturni pristop)
5. Načrtovanje IS (objektni z uporabo UML in strukturni pristop)
6. Testiranje IS
7. Vpeljava IS
8. Življenjski cikli razvoja IS
9. Metodologije razvoja IS
10. Principi agilnih metodologij in agilnega razvoja
11. Osnove izbire in prilagajanja razvojnih metodologij
12. Principi iterativnega razvoja IS

Content (Syllabus outline):

1. Key concepts of IS development
2. Structural and object oriented development principles
3. IS requirements acquisition
4. IS analysis (object oriented with UML and structural approach)
5. IS design (object oriented with UML and structural approach)
6. IS testing
7. IS deployment
8. IS development lifecycles
9. IS development methodologies
10. Principles of agile methodologies and agile development
11. Basics of selection and adaptation of development methodologies
12. Principles of iterative development of IS

Temeljni literatura in viri / Readings:

- Avison, D. E. in Fitzgerald, G. (2006). Information systems development, McGraw-Hill, London.
- Booch, G., J. Rumbaugh in I. Jacobson (1999). The Unified Software Development Process. Addison Wesley.
- Cockburn, A (2002). Agile Software Development. Pearson Education.

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

Cilj predmeta je pregledno predstaviti ključne koncepte, tehnike in pristope, ki se uporabljajo pri izgradnji sodobnih informacijskih sistemov. Poudarek je na sistematičnih pristopih na področju analize in načrtovanja, ki omogočajo izgradnjo kakovostnih informacijskih sistemov. Študenti spoznajo tudi ključne principe agilnih pristopov in iterativnega razvoja informacijskih sistemov.

Predvidene kompetence, ki jih pridobijo študenti:

Splošne kompetence:

- sposobnost kritičnega mišljenja
- razvoj sposobnosti kritičnega, analitičnega in sintetičnega mišljenja
- sposobnost opredelitve, razumevanja in reševanja strokovnih izzivov na področju računalništva in informatike
- sposobnost samostojne uporabe pridobljenega znanja pri reševanju tehničnih in znanstvenih izzivov na področju računalništva in informatike; sposobnost nadgradnje pridobljenega znanja
- sposobnost skupinskega dela v strokovnem okolju; vodenje majhne projektne skupine

Predmetno specifične kompetence:

- sposobnost prenosa znanja na sodelavce v tehnoloških in raziskovalnih skupinah
- praktična znanja in veščine na področju strojne opreme, programske opreme in informacijskih tehnologij, ki so nujna za uspešno delo na področju računalništva in informatike
- sposobnost samostojne izvedbe manj zahtevnih in zahtevnih inženirskih in organizacijskih opravil na določenih ozkih področjih in neodvisnega reševanja določenih dobro opredeljenih opravil na področju računalništva in informatike
- poznavanje terminologije s področja razvoja informacijskih sistemov
- razumevanje razlik med strukturnim in objektnim pristopom razvoja informacijskih sistemov
- poznavanje in uporaba diagramskih tehnik in pristopov za modeliranje informacijskih sistemov s poudarkom na UML

The course objectives are presentation and overview of the key concepts, techniques and approaches that are used in the development of modern information systems. The course focuses on systematic approaches in the field of analysis and design that enable development of quality information systems. Students are introduced to the key principles of agile development and to iterative development of information systems.

The competences students gain are:

General competences:

- ability of critical thinking
- developing skills in critical, analytical and synthetic thinking
- the ability to define, understand and solve creative professional challenges in computer and information science
- the ability to apply acquired knowledge in independent work for solving technical and scientific problems in computer and information science; the ability to upgrade acquired knowledge
- the ability of teamwork within the professional environment; management of a small professional team

Subject specific competences:

- the ability to transmit knowledge to co-workers in technology and research groups
- practical knowledge and skills of computer hardware, software and information technology necessary for successful professional work in computer and information science
- the ability to independently perform both less demanding and complex engineering and organisational tasks in certain narrow areas and independently solve specific well-defined tasks in computer and information science
- knowledge of terminology in the field of information systems development
- understanding the differences between structural and object oriented information systems development
- knowledge and use of information systems modelling diagramming techniques and approaches with focus on UML

- zbiranje, analiza in formalizacija zahtev za informacijski sistem
- načrtovanje informacijskega sistema na podlagi zbranih zahtev
- poznavanje postopka testiranja informacijskega sistema
- poznavanje postopka vpeljave informacijskega sistema
- poznavanje in uporaba konceptov agilnosti pri zasnovi procesa razvoja informacijskega sistema
- poznavanje in uporaba ključnih konceptov in tehnik iterativnega razvoja
- poznavanje in uporaba tipičnih življenjskih ciklov procesa razvoja informacijskega sistema
- izbira ustrezne razvojne metodologije glede na značilnosti projekta

- acquisition, analysis and formalization of information system requirements
- information system design based on the requirements
- knowledge of information system testing
- knowledge of information system deployment
- knowledge and use of agile concepts in the design of information system development process
- knowledge and use of the key concepts and techniques of iterative development
- knowledge and use of the typical information systems development lifecycles
- selection of the development methodology that suits project characteristics

Predvideni študijski rezultati:

Znanje in razumevanje:

Poznavanje osnovnih pojmov s področja razvoja informacijskih sistemov. Poznavanje ključnih principov in metodologij razvoja informacijskih sistemov. Razumevanje pomena metodologij za razvoj kakovostnih informacijskih sistemov. Razumevanje, kako različne lastnosti metodologij vplivajo na učinkovitost razvojnega procesa.

Uporaba:

Uporaba sistematičnih pristopov za analizo in načrtovanje informacijskih sistemov.

Refleksija:

Spoznavanje in razumevanje uglasenosti med teorijo in njeno uglasenostjo na konkretnih primerih s področja analize in načrtovanja informacijskih sistemov (npr. izdelava načrta informacijskega sistema).

Prenosljive spretnosti - niso vezane le na en predmet:

Uporaba IKT, pisno in ustno poročanje, delo v timih, komunikacijske in voditeljske spretnosti pri vodenju in sodelovanju v projekti ekipi.

Intended learning outcomes:

Knowledge and understanding:

Familiarity with basic concepts of information systems development. Familiarity with key information systems development principles and methodologies. Understanding of importance of software development methodologies for development of quality information systems. Understanding of influence of various methodology properties on effectiveness of the development process.

Application:

Use of systematic approaches for analysis and design of information systems.

Reflection:

Familiarization and understanding of alignment between theory and practical examples in the field of analysis and design of information systems (e.g. development of information systems design).

Transferable skills:

ICT usage, written and oral reporting, team work, communication and management skills in project management and group collaboration.

Metode poučevanja in učenja:

Predavanja, laboratorijske vaje, seminarske naloge. Poseben poudarek je na seminarskih nalogah, kjer študenti sami zajamejo zahteve in izdelajo načrt za informacijski sistem in ob tem teoretična znanja prenesejo v prakso.

Learning and teaching methods:

Lectures, laboratory exercises, seminar work. Special focus is on seminar work, where students gather requirements and design of an information system and transfer theoretical knowledge into practice.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, midterm exams, project work)</p> <p>Final (written exam)</p> <p>Grading: 6-10 pass, 5 fail</p> <p>(according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:**Pet najpomembnejših del:**

- Damjan Vavpotič, Marko Bajec, "An approach for concurrent evaluation of technical and social aspects of software development methodologies", Inf. softw. technol., vol. 51, no. 2, str. 528-545, 2009
- Damjan Vavpotič, Olegas Vasilecas, "An approach for assessment of software development methodologies suitability", Elektron. elektrotech., vol. 114, no. 8, str. 107-110, 2011
- Damjan Vavpotič, Tomaž Hovelja, "Improving the evaluation of software development methodology adoption and its impact on enterprise performance", Comput. Sci. Inf. Syst., vol. 9, no. 1, str. 165-187, Jan. 2012
- Simon Vrhovec, Marina Trkman, Aleš Kumer, Marjan Krisper, Damjan Vavpotič, "Outsourcing as an economic development tool in transition economies : scattered global software development", Inf. technol. dev., 25 str., 2014
- Tomaž Hovelja, Olegas Vasilecas, Damjan Vavpotič, Exploring the influences of the use of elements comprising information system development methodologies on strategic business goals, Tech. and eco. devel. of eco., vol. 21, no. 6, str. 885-898, 2015

Celotna bibliografija je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=13311>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Spletne tehnologije

Course title: Web Technologies

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika Interdisciplinarni univerzitetni študijski program prve stopnje Upravna inormatika	ni smeri	2	poletni
Professional study program Computer and Information Science, 1st cycle Interdisciplinary university Study Programme in Administrative Informatics 1 st Cycle	none	2	spring

Vrsta predmeta / Course type

RI: izbirni predmet / CIS: elective course
UI: obvezni predmet / AI: compulsory course

Univerzitetna koda predmeta / University course code:

63727

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	10	20	/	/	105	6

Nosilec predmeta / Lecturer:

doc. dr. Mira Trebar

Jeziki /

Predavanja / Lectures:

slovenščina
Slovene

Languages:

Vaje / Tutorial: slovenščina
Slovene

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

Osnove naslednjih predmetov iz predhodnih semestrov:

- Komunikacijski protokoli in omrežna varnost

Prerequisites:

The following subjects from previous semesters:

- Communications Protocols and Network Security

Vsebina:

- Uvod - spletne tehnologije
- Internet (računalnik, omrežje)
- Splet (WWW) – dokumentno zasnovan porazdeljen sistem
- Arhitektura spleta (model odjemalec-strežnik, komunikacija, imenovanje, ...)
- Standardi in protokoli
- Programiranje na strani odjemalcev: (X)HTML, Skriptni jeziki (JavaScript, jQuery,...)
- Programiranje na strani strežnika (PHP, CGI, servlet, ...)
- Tehnologije spletnega iskanja in pridobivanja virov (portali, iskalniki, forumi, ...)
- Meta- jezik XML (imenski prostor, XML preverjanje, predstavitveni formati, aplikacije XML, ...)
- XML zasnovane spletne storitve (SOAP, WSDL, UDDI), RESTful
- Spletno inženirstvo (strategije in metodologije razvoja spletnih aplikacij, uporabniška podpora)
- Varnost spletnih aplikacij (uporabniki, identitete, certifikati, šifriranje)
- Semantični splet

Content (Syllabus outline):

- Introduction – web technologies
- Internet (computer, network)
- Web (WWW) – distributed document-based system
- Web architecture (client-server model, communication, naming, ...)
- Standards and protocols
- Client programming: (X)HTML, Script programming (JavaScript, jQuery, ...)
- Server programming (PHP, CGI, servlet, ...)
- Web Search technologies and resource extraction (portal, Search engine, Forum, ...)
- Meta- language XML (naming, XML checking, presentation formats, XML applications)
- XML based web services (SOAP, WSDL, UDDI), RESTful
- Web engineering (methodologies and strategies of web application design, customer support)
- Web application security (users, identity, certificates, encryption)
- Semantic web

Temeljni literatura in viri / Readings:

- J.C. Jackson, Web technologies – A computer science perspective, Pearson, 2007.
- D. Flanagan, Javascript The definitive guide, 6th edition, O'Reilly, 2011.
- J.C. Meloni, PHP, MySQL and Apache All in One, www.it-ebooks.info, 2012.
- Spletni vir: <http://www.w3schools.com/>.

Cilji in kompetence:

Osnovni cilj predmeta je študentom predstaviti splet kot model porazdeljenega sistema in uporabo različnih spletnih tehnologij na strani odjemalca in na strani strežnika.

Pridobljena znanja študentom omogočajo samostojen razvoj spletnih strani, spletnih mest in spletnih aplikacij.

Pri teoretičnem in praktičnem delu razvijejo sposobnosti za razumevanje, reševanje kreativnih poklicnih izzivov v računalništvu in informatiki ter izkušnje za neodvisno delo pri reševanju tehničnih problemov, ki jim predstavljajo pomembna praktična znanja in veščine programskih tehnologij za uspešno poklicno delo.

Objectives and competences:

The primary objective of this course is to introduce students a Web as a distributed system and the use of online technologies on the client and server-side. The acquired knowledge will enable students to develop their own webpages, websites and web applications.

The theoretical and practical work helps them to develop skills for understanding and solving creative professional challenges in computer and information science and for independent work in solving technical problems and to apply the acquired practical skills and knowledge of software technologies for successful professional work.

Predvideni študijski rezultati:

Znanje in razumevanje:

Poznavanje spleta (interneta) predstavljenega kot porazdeljeni sistem, ki deluje po principu model odjemalec-strežnik.

Razumevanje razvoja in programiranja spletnih aplikacij, storitev na nivoju inženirskega dela.

Uporaba:

Uporaba spletnih tehnologij na področju spletnega inženirstva, tako na strani odjemalca, kot strežnika.

Refleksija:

Spoznavanje in razumevanje teorije spletnih tehnologij in njene uporabe pri praktičnem delu, tako v laboratoriju, kot tudi v realnih aplikacijah.

Prenosljive spretnosti:

Intended learning outcomes:

Knowledge and understanding:

Knowledge of web (Internet) presented as a distributed system that operates on the principle of client-server model.

Understanding the development and programming of web applications, services at the level of engineering work.

Application:

Use of web technologies in the area of web engineering, both at the client side as server side.

Reflection:

Insight and understanding of the theory of web technology and its application in practical work, both in the laboratory and in real applications.

Transferable skills:

Načrtovanje in razvoj spletnih rešitev na različnih inženirskih, kakor tudi drugih področjih.

Design and development of web solutions in various engineering, as well as other areas.

Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja in individualne naloge v povezavi s seminarji in projektnim delom v okviru laboratorijskih vaj naj bi na osnovi sprotnega povezovalnega načina omogočili doseganje navedenih študijskih ciljev.

Lectures and individual work in connection with seminars and project work in laboratory should on the basis of linking approach meet the study objectives.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, seminarji, projektno delo)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, seminars, project work)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail</p> <p>(In accordance with UL statute).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

- Trebar M, Šušteršič Z, Lotrič U (2007) Predicting mechanical properties of elastomers with neural networks. *Polymer (Guildf.)* 48(18): 5340-5347.
- TREBAR, Mira, STEELE, Nigel C. Application of distributed SVM architectures in classifying forest data cover types. *Comput. electron. agric.* [Print ed.], Oct. 2008, vol. 63, no. 2, str. 119-130.
- CUIÑAS, Inigo, CATARINUCCI, Luca, TREBAR, Mira. RFID from farm to fork: traceability along the complete food chain. V: *PIERS 2011 Marrakesh: proceedings*. Cambridge (MA): The Electromagnetics Academy, cop. 2011, str. 1370-1374.
- QI, Lin, XU, Mark, FU, Zetian, TREBAR, Mira, ZHANG, Xiaoshuan. C [sup] 2SLDS: a WSN-based perishable food shelf-life prediction and LFSO strategy decision support system in cold chain logistics. *Food control*, ISSN 0956-7135., 2014, vol. 38, str. 19-29.
- TREBAR, Mira, LOTRIČ, Metka, FONDA, Irena, PLETERŠEK, Anton, KOVAČIČ, Kosta. RFID data loggers in fish supply chain traceability. *International journal of antennas and propagation (Online)*, ISSN 1687-5877, vol. 2013, str. 1-9.

Celotna bibliografija je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=5908>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Vhodno-izhodne naprave

Course title: Input-Output Systems

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	poletni
Professional study program Computer and Information Science, 1st cycle	none	2	spring

Vrsta predmeta / Course type

izbirni predmet /elective course

Univerzitetna koda predmeta / University course code:

63728

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer:

viš. pred. Robert Rozman

Jeziki /

Languages:

Predavanja / Lectures:

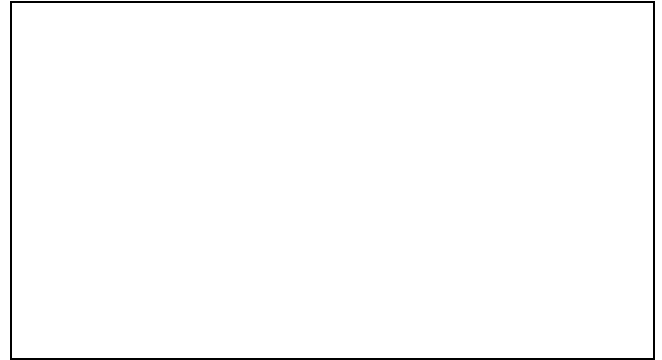
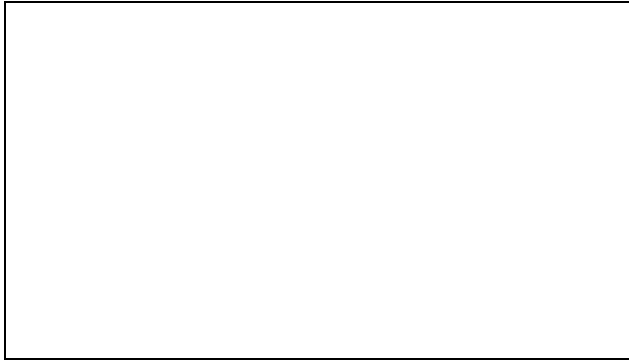
Vaje / Tutorial:

slovenščina
Slovene

slovenščina
Slovene

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

Prerequisites:

**Vsebina:**

- Lastnosti električnih linij (odboj, presluh, hitrost prenosa)
- Povezovalni standardi (RS232, RS485, USB, PCIe, TMDS, GTL)
- Naprave na osnovi magnetnega in optičnega shranjevanja podatkov
- Odkrivanje in popravljanje napak
- Komunikacijske V/I naprave
- Lokalne mreže (fizični in podatkovni nivo)

Content (Syllabus outline):

- Transmission Lines (Reflections, CrossTalk, Transfer rate)
- Interface Standards (RS232, RS485, USB, PCIe, TMDS, GTL) and Signaling
- Magnetic and Optic Storage Tehnology
- Error Detection and Correction
- Communication I/O Devices
- LAN (Physical and Data link Layer)

Temeljni literatura in viri / Readings:

1. D. Kodek, "Poglavja iz računalniških sistemov," Fakulteta za elektrotehniko, Ljubljana, 1989.
2. T. Granberg, Digital Techniques for High Speed Design, Pearson Education, Inc., 2007.
3. A. S. Tanenbaum, Structured Computer Organization, Sixth Edition, Pearson Prentice Hall, 2013.
4. Prosojnice na vsakoletni učilnici.

Cilji in kompetence:

Namen predmeta je predstaviti povezovalne probleme v digitalnih vezjih, vrste V/I naprav njihovo zgradbo, lastnosti in delovanje.

Objectives and competences:

Represent interconnection problems in digital circuits, principles of operation for some I/O devices and their properties.

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

<p>Znanje in razumevanje:</p> <p>Poznavanje zgradbe in razumevanje delovanja V/I naprav in njihovih povezav.</p> <p>Uporaba:</p> <p>To znanje je pomembno pri izbiri, nakupu in učinkoviti uporabi V/I naprav.</p> <p>Refleksija:</p> <p>Izboljšati pregled nad tehnološkimi dosežki na področju V/I naprav.</p> <p>Prenosljive spretnosti - niso vezane le na en predmet:</p> <p>Predmet se dopolnjuje s predmeti s področja digitalnih vezij, računalniških komunikacij in mrež.</p>	<p>Knowledge and understanding:</p> <p>Knowledge and understanding of the structure of I/O devices and their interfacing.</p> <p>Application:</p> <p>Knowledge is important in the selection, purchase and effective use of I/O devices.</p> <p>Reflection:</p> <p>Improve oversight of technological achievements in the field of I/O devices.</p> <p>Transferable skills:</p> <p>Complements the knowledge for software engineering, digital logic and computer networking.</p>
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Metode poučevanja in učenja:

Learning and teaching methods:

<p>Predavanja, laboratorijske vaje, poročila z laboratorijskih vaj in seminarske naloge.</p>	<p>Lectures and laboratory exercises. Reports of laboratory exercises and seminars.</p>
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, midterm exams, project work)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail</p> <p>(according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

<p>Pet najpomembnejših del:</p>
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- Programska in aparaturna oprema za krmiljenje prometnih signalov semaforiziranega križišča. Ljubljana Iskra Avtomatika 1977-1979 (D.Kodek, B.Vilfan, T.Mohorič, I.Škraba)
- Programska oprema za krmiljenje in uporabo V/I enot pri Najavnem centru v MTC Moskva. Ljubljana, Iskra ATC, 1979-1983.
- Razvoj in izdelava sistema za razpoznavanje izoliranih besed slovenskega govora. Ljubljana PTT-Ljubljana, 1992-1994 (D.Kodek, D.Hvala, B.Petek, I.Škraba, D.Šonc)
- KODEK, Dušan, ŠKRABA, Igor. *Računalniške komunikacije*, (Računalniški komunikacijski sistemi in mreže). Ljubljana: RSS, 1985. 25 str. [COBISS-ID 11025664]
- ŠKRABA, Igor, KODEK, Dušan. Preverjanje kakovosti programske opreme. V: ZAJC, Baldomir (ur.). *Zbornik druge Elektrotehniške in računalniške konference ERK '93, september 1993, Portorož, Slovenija*. Ljubljana: IEEE Region 8, Slovenska sekcija IEEE, 1997, zv. B, str. 115-117. [COBISS-ID 802388]

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Celotna bibliografija je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=4928>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Načrtovanje digitalnih naprav

Course title: Digital Logic Design

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	poletni
Professional study program Computer and Information Science, 1st cycle	none	2	spring

Vrsta predmeta / Course type

izbirni predmet /elective course

Univerzitetna koda predmeta / University course code:

63729

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer:

doc. dr. Miha Moškon

Jeziki /

Languages:

Predavanja / Lectures:

Vaje / Tutorial:

slovenščina
Slovene

slovenščina
Slovene

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

Prerequisites:

Vpis naslednjih predmetov iz predhodnih semestrov:

- Organizacija računalnikov
- Digitalna vezja

The following subjects from previous semesters:

- Computer Organization
- Digital Circuits

Vsebina:

- Uvod v načrtovanje in testiranje digitalnih sistemov.
- Jeziki za opis strojne opreme (VHDL, Verilog):
 - osnove HDL jezikov,
 - napotki za načrtovanje in modeliranje,
 - simulacija načrtovanja,
 - sinteza načrtovanja.
- Tehnologija in pregled programabilnih vezij: PAL, PLA, ROM, CPLD, FPGA.
- Načrtovanje odločitvenih in sekvenčnih vezij:
 - računalniška aritmetika,
 - dvo in večnivojske funkcije,
 - pomnilne celice,
 - register, registrski niz,
 - števcji,
 - pomnilnik,
 - avtomati končnih stanj,
 - sinhronizacija.
- Signal ure: tvorba, širjenje, porazdelitev, "clock gating".
- Načrtovanje preprostega (mikro)procesorja oziroma sistema na čipu (SoC):
 - podatkovne poti,
 - kontrolna enota,
 - vhodno/izhodni vmesniki in
 - komunikacija.

Content (Syllabus outline):

1. Introduction to design and testing of digital systems.
2. Languages for hardware description (VHDL, Verilog):
 - introduction to HDL,
 - design and modelling instructions,
 - circuit simulation,
 - design synthesis.
3. Technology and survey of programmable logic circuits: PAL, PLA, ROM, CPLD, FPGA.
4. Design of decision and sequential circuits:
 - computer arithmetic,
 - two and multilevel functions,
 - flip-flops,
 - register, register set,
 - counters,
 - memory,
 - finite state automata,
 - synchronization.
5. Clock signal:
 - generation,
 - propagation,
 - distribution,
 - "clock gating".
6. Design of simple (micro)processor or SOC:
 - data path,
 - control unit,
 - i/o interfaces and
 - communication.

Temeljni literatura in viri / Readings:

- Wakerly, John F. Digital design: principles and practices, Upper Saddle River : Pearson/Prentice Hall, 2006
- M. M. Mano, C. R. Kime, Logic and computer design fundamentals, Upper Saddle River: Pearson Prentice Hall, 2007
- S. Brown, Z. Vranesic, Fundamentals of digital logic with VHDL design, McGraw-Hill, 2005
- A. Trost, Načrtovanje digitalnih vezij v jeziku VHDL, Fakulteta za elektrotehniko, 2007
- M. Ercegovac, T. Lang, J. H. Moreno, Introduction to digital systems, J. Wiley & Sons, 1999

Cilji in kompetence:

Študenta želimo naučiti samostojne uporabe in načrtovanja digitalnih vezij z uporabo HDL orodij. Pri tem izpostavimo posebnosti HDL orodij in naučimo upoštevati optimalne pristope k načrtovanju digitalnih vezij.

Objectives and competences:

We instruct students in practical design and independent work on digital circuits with the use of HDL language. Specific behaviour of HDL tools is emphasized and digital circuit design using optimal approaches is presented.

Predvideni študijski rezultati:

Znanje in razumevanje:

6001 Digitalna vezja

6003 Organizacija računalnikov

1003 Računalniška arhitektura

programiranje v VHDL

Uporaba:

Načrtovanje vezij, sistem na čipu (SoC).

Refleksija:

Izdelava seminarja in preizkus vezja.

Prenosljive spretnosti - niso vezane le na en

predmet:

Izdelava seminarja in preizkus vezja.

Intended learning outcomes:

Knowledge and understanding:

6001 Digital circuits

6003 Computer Organization

1003 Computer Architecture

programming in VHDL

Application:

Circuit design, system on chip (SOC) design.

Reflection:

Project report and implementation.

Transferable skills:

Project report and implementation.

Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja, laboratorijske vaje, seminar.	Lectures, lab. course, project.
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt): Sprotno preverjanje (domače naloge, kolokviji in projektno delo) Končno preverjanje (pisni in ustni izpit) Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).	 50% 50%	Type (examination, oral, coursework, project): Continuing (homework, midterm exams, project work) Final (written and oral exam) Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del: / Five most important works:

1. MOŠKON, Miha, MRAZ, Miha. Systematic approach to computational design of gene regulatory networks with information processing capabilities. IEEE/ACM transactions on computational biology and bioinformatics, ISSN 1545-5963., 2014, vol. 11, no. 2, str. 431-440. [COBISS.SI-ID 10323028]
2. STRAŽAR, Martin, MRAZ, Miha, ZIMIC, Nikolaj, MOŠKON, Miha. An adaptive genetic algorithm for parameter estimation of biological oscillator models to achieve target quantitative system response. Natural computing, ISSN 1567-7818, Mar. 2014, vol. 13, no. 1, str. 119-127. [COBISS.SI-ID 9950804]
3. MOŠKON, Miha, NOVAK, Štefan, MEDEOT, Marino, LEBAR BAJEC, Iztok, ZIMIC, Nikolaj, MRAZ, Miha. Solving the logistic problems with optimal resource assignment using fuzzy logic methods. Journal of advanced transportation, June 2013, vol. 47, no. 4, str. 447-460. [COBISS.SI-ID 8198740].
4. ŠOBERL, Domen, ZIMIC, Nikolaj, LEONARDIS, Aleš, KRIVIC, Jaka, MOŠKON, Miha. Hardware implementation of FAST algorithm for mobile applications. Journal of signal processing systems for signal, image, and video technology, 2013, str. [1-10]. [COBISS.SI-ID 10041428]
5. MOŠKON, Miha, MRAZ, Miha. Modelling and analysing the information processing capabilities of simple biological systems. Mathematical modelling and analysis, Sep. 2012, vol. 17, no. 4, str. 467-484. [COBISS.SI-ID 9330004]

Celotna bibliografija je dostopna na COBISS:

<http://splet02.izum.si/cobiss/bibliography?langbib=slo&code=29198&formatbib=3>.

Complete bibliography is accessible on COBISS:

<http://splet02.izum.si/cobiss/bibliography?langbib=eng&code=29198&formatbib=3>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Tehnične veščine
Course title:	Computer Science Skills

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2, 3	zimski/ poletni
Professional study program Computer and Information Science, 1 cycle	none	2, 3	fall/spring

Vrsta predmeta / Course type izbirni predmet / elective course

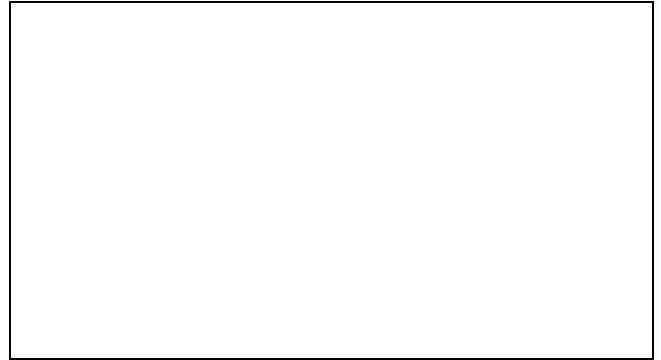
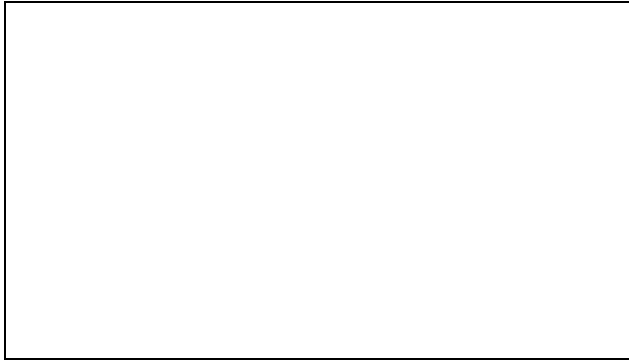
Univerzitetna koda predmeta / University course code: 63767

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
15	/	45	/	/	30	3

Nosilec predmeta / Lecturer: skrbnika študijskih programov računalništva in informatike 1. stopnje

Jeziki / Languages:	Predavanja / Lectures:	slovenščina, angleščina Slovene, English
	Vaje / Tutorial:	slovenščina, angleščina Slovene, English

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

**Vsebina:**

Predmet je praktično naravnan in je namenjen temu, da se študente seznanijo z delom v konkretnih računalniških okoljih in jezikih in s konkretnimi orodji, ki so v študijskem programu izpadli, so manj poudarjeni ali pa so se pojavili šele pred kratkim, so pa pomembni za delo v praksi in za sposobnost razumevanja in izvedbe konkretnih računalniških nalog in del. Primeri so posamezni programski jeziki (Coq, Scheme, Dart, Ceylon, Go, F#, Opa,...) in okolja (Mathematica, Django, Android, iOS), nove tehnologije v računalništvu (kvantni računalniki, DNA računalniki,...) in novi pristopi k računanju (kvantno računanje, Blue Brain,...). V računalništvu se takšne nove teme redno pojavljajo, nemogoče je, da bi bile vse takšne zanimivosti in novosti vključene v obvezne ali strokovno izbirne predmete, smiselno pa je, da ponudimo študentom možnost, da se njimi seznanijo.

Content (Syllabus outline):

The course is practically oriented and intended for introducing the students to practical work on specific platforms and in specific languages that are not included in other courses or have appeared only recently and are important for practical work and for completing specific tasks, and projects. Examples of such topics are specific programming languages (Coq, Scheme, Dart, Ceylon, Go, F#, Opa,...) and platforms (Mathematica, Django, Android, iOS), new and emerging technologies (quantum computers, DNA computers,...) and new approaches to computing (quantum computing, Blue Brain project,...). Such new topics and concepts regularly appear in computer and information science and it is reasonable to give the students an opportunity to learn about them.

Temeljna literatura in viri / Readings:

[Thomas H. Cormen](#), [Charles E. Leiserson](#): Introduction to Algorithms, 3rd edition, MIT Press, 2009.

Knuth, Donald: The Art of Computer Programming, ADDISON WESLEY (PEARSON (2011)

The pragmatic bookshelf (<http://pragprog.com/>)

Dodatna literatura se predpiše vsako leto posebej glede na vsebino in predloge izbranega predavatelja.

Additional literature is given annually based on the current topic of the course.

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

Cilj predmeta je podrobneje spoznati praktične in učinkovite pristope in temeljito spoznati delo v posameznih orodjih, jezikih in okoljih.

The object of this course is mastering and understanding efficient practical solutions and gaining a thorough understanding of specific tools, programming languages, or platforms.

Predvideni študijski rezultati:

Znanje in razumevanje:

Študenti spoznavajo praktično delo s konkretnimi orodji in okolji.

Uporaba:

Uporaba najnovejših pristopov in tehnik v izbranem okolju, jeziku ali orodju.

Refleksija:

Temeljito poznavanje najnovejših orodij in platform, seznanjanje s povsem praktičnimi problemi in rešitvami pri konkretnem programerskem in razvojnem delu na področju računalništva.

Prenosljive spretnosti - niso vezane le na en

predmet: poznavanje praktičnih pristopov, prilagodljivost pri uporabi različnih orodij in delu v različnih računalniških okoljih.

Intended learning outcomes:

Lerning and understanding:

The students are acquainted with practical work using specific tools and specific platforms.

Application:

Applying state-of-the-art techniques and approaches on a chosen platform, language, or tool.

Reflection:

A thorough knowledge of a specific state-of-the-art tool or platform, a close encounter with practical problems and solutions in specific programming and engineering work in computer and information science.

Transferable skills:

Understanding »tricks of the trade«, developing a flexibility and ability to adapt to work in different contexts.

Metode poučevanja in učenja:

Predavanja, laboratorijske vaje.

Learning and teaching methods:

Lectures, lab practice.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

Type (examination, oral, coursework, project):

Sprotno preverjanje (domače naloge, kolokviji in projektno delo)	50%	Continuing (homework, midterm exams, project work)
Končno preverjanje (pisni in ustni izpit)	50%	Final (written and oral exam)
Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).		Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:

izr. prof. dr. Zoran Bosnić:

- ZUPANC, Kaja, BOSNIĆ, Zoran. Automated essay evaluation with semantic analysis. Knowledge-based systems, ISSN 0950-7051. [Print ed.], Mar. 2017, vol. 120, str. 118-132.
- OCEPEK, Uroš, RUGELJ, Jože, BOSNIĆ, Zoran. Improving matrix factorization recommendations for examples in cold start. Expert systems with applications, ISSN 0957-4174. [Print ed.], Nov. 2015, vol. 42, no. 19, str. 6784-6794.
- BOSNIĆ, Zoran, DEMŠAR, Jaka, KEŠPRET, Grega, Rodrigues, Pedro Pereira, Gama, João, Kononenko, Igor. Enhancing data stream predictions with reliability estimators and explanation. Engineering applications of artificial intelligence, ISSN 0952-1976. [Print ed.], 2014, vol. 34, str. 178-192.
- BOSNIĆ, Zoran, KONONENKO, Igor. Estimation of individual prediction reliability using the local sensitivity analysis. Applied intelligence, ISSN 0924-669X. [Print ed.], Dec. 2008, vol. 29, no. 3, str. 187-203, ilustr.
- BOSNIĆ, Zoran, KONONENKO, Igor. Comparison of approaches for estimating reliability of individual regression predictions. Data & Knowledge Engineering, ISSN 0169-023X. [Print ed.], Dec. 2008, vol. 67, no. 3, str. 504-516.

Celotna bibliografija je dostopna na SICRISu / For complete bibliography see SICRIS:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=31318>.

doc. dr. Tomaž Dobravec

MIHELIC, Jurij, DOBRAVEC, Tomaž. SicSim: A simulator of the educational SIC/XE computer for a system-software course. Computer applications in engineering education, ISSN 1061-3773, 2015, vol. 23, no. 1, pp. 137-146

ČEŠNOVAR, Rok, RISOJEVIĆ, Vladimir, BABIĆ, Zdenka, DOBRAVEC, Tomaž, BULIĆ, Patricio. A GPU implementation of a structural-similarity-based aerial-image classification. The journal of supercomputing, ISSN 0920-8542, 2013, vol. 65, no. 2, pp. 978-996

BULIĆ, Patricio, DOBRAVEC, Tomaž. An approximate method for filtering out data dependencies with a sufficiently large distance between memory references. The journal of supercomputing, ISSN 0920-8542, 2011, vol. 56, no. 2, pp. 226-244

DOBRAVEC, Tomaž, ŽEROVNIK, Janez, ROBIČ, Borut. An optimal message routing algorithm for circulant networks. *J. systems archit.*. [Print ed.], 2006, vol. 52, no. 5, str. [298]-306

DOBRAVEC, Tomaž, ROBIČ, Borut. Restricted shortest paths in 2-circulant graphs. *Comput. commun.*. [Print ed.], March 2009, vol. 32, no. 4, str. 685-690

Celotna bibliografija doc. dr. Dobravca je dostopna na SICRISu:
<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=10416>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Planiranje in upravljanje informatike
Course title:	IT Governance

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	3	zimski
Professional study program Computer and Information Science, 1st cycle	none	3	fall

Vrsta predmeta / Course type izbirni predmet /elective course

Univerzitetna koda predmeta / University course code: 63768

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer: doc. dr. Rok Rupnik

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

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

Vpis naslednjih predmetov iz predhodnih semestrov:

- Razvoj informacijskih sistemov
- Informacijski sistemi

The following subjects from previous semesters:

- Information Systems Development
- Information Systems

Vsebina:

Predavanja:

- Vloga informatike v podjetjih
- Namen in cilji strateškega planiranja ter povezava strateškega planiranja s poslovno strategijo podjetja
- Metodologija strateškega planiranja informatike: izdelava, skrbništvo in spremljanje izvajanja strateških planov
- Prilagajanje metodologije strateškega planiranja potrebam podjetja
- Obvladovanje informatike v podjetjih
- Ogradja za obvladovanje informatike: ITIL in CobIT
- Posebnosti planiranja in vodenja projektov na področju informatike
- Pravni vidiki informatike in obvladovanje pogodbenih razmerij v informatiki
- SWOT analiza in metoda uravnoteženih kazalnikov
- Poslovna informacijska arhitektura

Vaje:

1. Analiza dveh IT procesov po modelu/ogrodju COBIT
2. Tehnike predstavitev poslovodstvu
3. Tehnike predstavitev informatikom
4. Izdelava pogodbe za IT storitve
5. Izdelava pogodbe za aplikacijo po naročilu

Content (Syllabus outline):

Lectures:

1. The role of IT in companies
2. The purpose and objectives of strategic planning and connection with the business strategy
3. IT strategic planning methodology: preparation, administration, and monitoring the implementation of strategic plans
4. Adapting the methodology of strategic planning to business needs
5. IT governance in companies
6. IT management frameworks: ITIL and COBIT
7. Special features of project management in the field of informatics
8. Legal aspects of informatics and management of contractual relationships in IT
9. SWOT analysis and balanced scorecard
10. Enterprise architecture

Exercises:

1. Analysis of two IT process based on COBIT framework
2. Presentation techniques to perform presentations for management
3. Presentation techniques to perform presentations for IT staff
4. Creation of contract for IT services
5. Creation of contract for application development

Temeljni literatura in viri / Readings:

1. IT Governance: Policies & Procedures, Michael Wallace, Larry Webber, Wolters Kluwer Law & Business, 2013
2. COBIT 4.1 and COBIT 5; free PDF files on www.isaca.org
3. Introduction to IT project management, Cyntia Snyder, PMP and Frank Parth, PMP; Management concepts, 2007

Cilji in kompetence:

Cilj predmeta je študentom predstaviti temeljna področja in temeljne pojme področja strateškega planiranja informatike in obvladovanja informatike. Študentje spoznajo metodologijo strateškega planiranja informatike in v okviru tega izdelavo, skrbništvo ter spremljanje izvajanja strateških planov. V okviru obvladovanja informatike spoznajo ogrodji CobIT in ITIL ter v okviru njih ključne IT procese. Na ta način spoznajo delovanje informatike v poslovnih sistemih ter zahteve, ki jih poslovni sistemi imajo do informatike.

Objectives and competences:

The aim of this course is to introduce students to core areas and basic concepts of IT strategic planning and IT management. Students learn the methodology of IT strategic planning and in the context of this the construction, administration and monitoring of the implementation of strategic plans. In the context of IT management they get to know COBIT and ITIL frameworks and their key IT processes. In this way the students learn about the IT in business systems and requirements that business systems have toward informatics.

Predvideni študijski rezultati:

Znanje in razumevanje:

Razumevanje pomena strateškega planiranja informatike v poslovnih sistemih;

Poznavanje in razumevanje konceptov delovanja in vloge IT procesov v poslovnih sistemih;

Poznavanje konceptov pogodbenih razmerij na področju informatike.

Uporaba:

Uporaba metodologije strateškega planiranja v praksi;

Uporaba ogrodij CobIT in ITIL za namene analize stanja informatike v podjetjih.

Refleksija:

Spoznavanje in razumevanje potreb poslovnih sistemov na področju obvladovanja informatike.

Prenosljive spretnosti - niso vezane le na en predmet:

Intended learning outcomes:

Knowledge and understanding:

Understanding of the importance of IT strategic planning in business systems;

Knowledge and understanding of concepts and applications of IT processes in business systems;

Knowledge of the concepts of contractual relationships in the field of informatics.

Application:

Using the methodology of IT strategic planning in practice;

Using COBIT and ITIL frameworks for an analysis of the state of IT in business systems.

Reflection:

Getting to know and understand the needs of business systems in the field of informatics.

Transferable skills:

Understanding the importance and the role of IT and on this basis, solving problems and defining the information needs of the business systems.

Razumevanje pomena in vloge informatike ter na podlagi tega reševanje problemov in definiranje informacijskih potreb v poslovnih sistemih.

Metode poučevanja in učenja:

Predavanja (tudi vabljeni predavatelji, ki so ugledni in uveljavljeni strokovnjaki na področju strateškega planiranja informatike in obvladovanja informatike).

Seminarske naloge v okviru vaj, kjer bo prisotno tudi skupinsko delo.

Learning and teaching methods:

Lectures (including invited speakers who are respected experts in the field of IT strategic planning and IT governance). Seminar papers in the context of exercises, which will also focus on teamwork.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

- seminarska naloga
- dva kolokvija med semestrom
- sodelovanje na predavanjih

Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).

45%

45%

10%

Type (examination, oral, coursework, project):

- one project
- two examinations during semester
- active participation on lectures

Grading: 6-10 pass, 5 fail (according to the UL Statutes).

Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

- PIVK, Aleksander, VASILECAS, Olegas, KALIBATIENE, Diana, RUPNIK, Rok. On approach for the implementation of data mining to business process optimisation in commercial companies. Technological and economic development of economy, ISSN 2029-4913. [Print ed.], June 2013, vol. 19, no. 2, str. 237-256. [COBISS.SI-ID 10340948]
- HOVELJA, Tomaž, VASILECAS, Olegas, RUPNIK, Rok. A model of influences of environmental stakeholders on strategic information systems planning success in an enterprise. Technological and economic development of economy, ISSN 2029-4913. [Print ed.], 2013, vol. 19, no. 3, str. 465-488, ilustr. <http://www.tandfonline.com/doi/pdf/10.3846/20294913.2013.818591>, doi: 10.3846/20294913.2013.818591. [COBISS.SI-ID 10183252]
- LAVBIČ, Dejan, VASILECAS, Olegas, RUPNIK, Rok. Ontology-based multi-agent system to support business users and management. Technological and economic development of economy, ISSN 1392-8619. Print ed., 2010, vol. 16, no. 2, str. 327-347, ilustr. http://www.tede.vgtu.lt/upload/ukis_zurn/tede_vol16_no2_327-347_lavbic.pdf. [COBISS.SI-ID 7731796]

- RUPNIK, Rok, KUKAR, Matjaž, KRISPER, Marjan. Integrating data mining and decision support through data mining based decision support system. The Journal of computer information systems, ISSN 0887-4417, 2007, vol. 47, no. 3, str. 89-104, ilustr. [COBISS.SI-ID 5928788]
- VASILECAS, Olegas, DUBAUSKAITĖ, Rūta, RUPNIK, Rok. Consistency checking of UML business model. Technological and economic development of economy, ISSN 2029-4913. [Print ed.], 2011, vol. 17, no. 1, str. 133-150, ilustr.
<http://web.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=3&hid=110&sid=e420e188-46e3-4748-8272-b2f3eda0892c%40sessionmgr113>. [COBISS.SI-ID 8607060]

Celotna bibliografija doc. dr. Rupnika je dostopna na SICRISu:

<http://sicris.izum.si/search/rsr.aspx?lang=slv&id=8740>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Sistemska programska oprema
Course title:	System Software

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	3	zimski
Professional study program Computer and Information Science, 1st cycle	none	3	fall

Vrsta predmeta / Course type izbirni predmet /elective course

Univerzitetna koda predmeta / University course code: 63736

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer: prof. dr. Branko Šter / associate professor

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

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

**Vsebina:**

1. Sistemsko programiranje, sistemski klici, sistemske knjižnice
2. Datotečni vhod/izhod, datoteke, mape
3. Standardni vhod/izhod
4. Procesi
5. Signali
6. Semaforji
7. Medprocesna komunikacija
8. Niti
9. Omrežno programiranje, vtičnice
10. TCP odjemalec in strežnik
11. Gonilniki in moduli (znakovni, bločni)
12. Prevajanje in nalaganje gonilnikov, testiranje in razhroščevanje
13. Gonilniki in strojna oprema

Content (Syllabus outline):

1. System programming, system calls, system libraries
2. File input/output, files, directories
3. Standard input/output
4. Processes
5. Signals
6. Semaphores
7. Interprocess communication
8. Threads
9. Network programming, sockets
10. TCP client and server
11. Device drivers and modules (character and block drivers)
12. Compiling and loading of drivers, testing and debugging
13. Device drivers and hardware

Temeljni literatura in viri / Readings:

1. W. Richard Stevens: Advanced Programming in the UNIX environment, Addison-Wesley, 1992.
2. W. Richard Stevens: UNIX Network Programming, Volume 1, Second Edition: Networking APIs: Sockets and XTI, Prentice Hall, 1998.
3. J. Corbet, A. Rubini, G. Kroah-Hartman: Linux Device Drivers, O'Reilly, 2005.
4. R. Love: Linux System Programming, O'Reilly, 2007.

Cilji in kompetence:

Cilj predmeta je študentom računalništva in informatike podati osnovne značilnosti sistemske programske opreme računalniških sistemov. Poudarek je na sistemskem programiranju, omrežnem programiranju in na gonilnikih.

Objectives and competences:

The course aims to present to students of computer science basic features of system software in computer systems. The emphasis is on system programming, network programming and device drivers.

Kompetence:

Zmožnost razumevanja in reševanja profesionalnih izzivov v računalništvu in informatiki.

Zmožnost uporabe pridobljenega znanja pri samostojnem delu pri reševanju tehničnih in znanstvenih problemov v računalništvu in informatiki; zmožnost nadgradnje pridobljenega znanja.

Praktično znanje in veščine, potrebne za uspešno profesionalno delo v računalništvu in informatiki.

Zmožnost samostojne izvedbe inženirskih in organizacijskih nalog v določenih ozkih področjih in samostojnega reševanja specifičnih dobro definiranih nalog v računalništvu in informatiki.

Osnovne veščine v računalništvu in informatiki, možnost nadaljevanja študija na drugi stopnji.

Competences:

The ability to understand and solve professional challenges in computer and information science.

The ability to apply acquired knowledge in independent work for solving technical and scientific problems in computer and information science; the ability to upgrade acquired knowledge.

Practical knowledge and skills necessary for successful professional work in computer and information science.

The ability to independently perform both less demanding and complex engineering and organisational tasks in certain narrow areas and independently solve specific well-defined tasks in computer and information science.

Basic skills in computer and information science, allowing the continuation of studies in the second study cycle.

Predvideni študijski rezultati:**Znanje in razumevanje:**

Poznavanje temeljnih konceptov systemske programske opreme; poznavanje interakcije med strojno in programsko opremo. Razumevanje pomena in uporabe gonilnikov in programskih orodij v računalniških sistemih.

Uporaba:

Poznavanje in razumevanje systemske programske opreme je pomembno pri programiranju računalniških sistemov, pri načrtovanju računalniških sistemov in pri systemski administraciji.

Refleksija:

Na podlagi temeljnih znanj in primerov iz prakse se pridobi sposobnost razumevanja, uporabe, vrednotenja, analize in načrtovanja systemske programske opreme.

Prenosljive spretnosti:

Pridobljena znanja omogočajo boljše razumevanje zgradbe in delovanja računalniških sistemov. Praktični pristop pri reševanju konkretnih

Intended learning outcomes:**Knowledge and understanding:**

Knowledge of basic concepts of system software; understanding the interaction between hardware and software. Understanding of operation and application of device drivers and software utilities in computer systems.

Application:

Knowledge and understanding of system software is important in computer programming, in design of computer systems and in system administration.

Reflection:

Based on the basic knowledge and practical examples the student obtains the ability of understanding, usage, evaluation, analysis and design of system software in computer systems.

Transferable skills:

Acquired knowledge enables better understanding of architecture and operation of computer systems. Practical approach to problem solving provides an upgrade of the fundamental skills and integration of issues in related areas.

problemov pa nudi nadgradnjo temeljnih znanj in povezovanje problematik na sorodnih področjih.

Metode poučevanja in učenja:

Predavanja, laboratorijske vaje, delo doma.

Learning and teaching methods:

Lectures, laboratory exercises, homeworks.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Sprotno preverjanje: domače naloge

40%

Continuing: homeworks

Končno preverjanje: pisni izpit in programerska naloga

30%, 30%

Final: written exam and programming exam

Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).

Grading: 6-10 pass, 5 fail

(according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

1. Branko Šter: Selective recurrent neural network. *Neural processing letters*, 38(1): 1-15, 2013.
2. Dominik Olszewski, Branko Šter: Asymmetric clustering using the alpha-beta divergence. *Pattern Recognition*, 47(5): 2031-2041, 2013.
3. Rok Gaber, Tina Lebar, Andreja Majerle, Branko Šter, Andrej Dobnikar, Mojca Benčina, Roman Jerala: Designable DNA-binding domains enable construction of logic circuits in mammalian cells. *Nature Chemical Biology*, 10(3): 203-208, 2014.
4. Andrej Dobnikar, Branko Šter: Structural properties of recurrent neural networks. *Neural processing letters*, 29(2): 75-88, 2009.
5. Jernej Zupanc, Damjana Drobne, Branko Šter: Markov random field model for segmenting large populations of lipid vesicles from micrographs. *Journal of liposome research*, 21(4): 315-323, 2011.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Procesna avtomatika

Course title: Process Automation

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	3	zimski
Professional study program Computer and Information Science, 1st cycle	none	3	fall

Vrsta predmeta / Course type

izbirni predmet /elective course

Univerzitetna koda predmeta / University course code:

63737

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	10	20	/	/	105	6

Nosilec predmeta / Lecturer:

izr. prof. dr. Uroš Lotrič

Jeziki /

Predavanja / Lectures:

slovenščina
Slovene

Languages:

Vaje / Tutorial:

slovenščina
Slovene

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

Prerequisites:

Vpis naslednjega predmeta iz predhodnega semestra:

- Vhodno- izhodne naprave

The following subject from previous semesters:

- Input-Output Systems

Vsebina:

- Sistemi in sistemska teorija
- Principi vodenja in teorija vodenja
- Sistemi za vodenje
- Metode in postopki za realizacijo funkcij vodenja
- Industrijski merilni sistemi
- Izvršni sistemi v vodenju procesov
- Vmesniki in signalne povezave
- Programirljivi logični krmilniki
- Standardni programski jeziki za programiranje logičnih krmilnikov
- Industrijski komunikacijski protokoli
- Naprave za komunikacijo s človekom
- Standard OPC
- Namen in funkcije nadzornih sistemov

Content (Syllabus outline):

- Systems and the system theory
- Principles of control and the control theory
- Automated systems
- Methods and procedures for implementation of control functions
- Industrial sensors
- Actuators
- Interfaces and signal connections
- Programmable logic controllers
- Programming languages for programmable logic controllers
- Industrial communication protocols
- Human machine interfaces
- The OPC standard
- The purpose and functions of the Management Execution Systems

Temeljni literatura in viri / Readings:

- S. Strmčnik (Ur.): Celostni pristop k računalniškemu vodenju procesov, Založba FE in FRI, Ljubljana, 1998, ISBN: 961-6210-51-3.
- R. C. Dorf: Modern Control Systems. Adisson-Wesley, Reaking MA, 2000, ISBN:0-13-30660-6.
- J. Stenerson: Fundamentals of Programmable Logic Controlers, Sensors, and Communications, Prentice-Hall, Englewood Cliffs, 1999, ISBN: 0-13-746124-0.

Cilji in kompetence:

Študentje naj bi v okviru tega predmeta pridobili znanja, ki so potrebna za zasnovo in izvedbo celovite računalniške podpore vodenja procesov.

Objectives and competences:

During the course students should gain the knowledge needed to design and implement computer aided control of industrial processes.

Predvideni študijski rezultati:

<ul style="list-style-type: none"> • Znanje in razumevanje: poznavanje osnovnih principov in elementov računalniškega vodenja. • Uporaba: računalniško vodenje procesov. • Refleksija: spoznavanje in razumevanje uglasenosti med teorijo in aplikacijo pri vodenju procesov. • Prenosljive spretnosti - niso vezane le na en predmet: sistemska integracija, celostni vidik računalniškega sistema v podjetju.

Intended learning outcomes:

<ul style="list-style-type: none"> • Knowledge and understanding: cognition of basic principles and elements of computer aided process control. • Application: process automation. • Reflection: learning and understanding of connection between theory and application in process control. • Transferable skills: system integration, aspects of computer aided manufacturing.
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Metode poučevanja in učenja:

Predavanja, praktične vaje na modelnih sistemih.
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Learning and teaching methods:

Lectures, practical exercises using models of real production lines and robots.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):		Type (examination, oral, coursework, project):
Projektno delo	50%	Homework
Ustni izpit	50%	Oral exam
Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).		Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:**Pet najpomembnejših del:**

<ol style="list-style-type: none"> 1. BRATINA, Marko, ŠUŠTERIČ, Zoran, ŠTER, Branko, LOTRIČ, Uroš, DOBNIKAR, Andrej. Predictive control of rubber mixing process based on neural network models. Kautschuk-Gummi-Kunststoffe, 2009, vol. 62, 378-382

2. SILVA, Catarina, LOTRIČ, Uroš, RIBEIRO, Bernardete, DOBNIKAR, Andrej. Distributed text classification with an ensemble kernel-based learning approach. IEEE trans. syst. man cybern., Part C Appl. rev., May 2010, vol. 40, 287-297
3. LOTRIČ, Uroš, BULIČ, Patricio. Applicability of approximate multipliers in hardware neural networks. Neurocomputing, 2012, vol. 96, 57-65
4. SLUGA, Davor, CURK, Tomaž, ZUPAN, Blaž, LOTRIČ, Uroš. Acceleration of information-theoretic data analysis with graphics processing units. Prz. Elektrotech., 2012, 136-139
5. CANKAR, Matija, ARTAČ, Matej, ŠTERK, Marjan, LOTRIČ, Uroš, SLIVNIK, Boštjan. Co-allocation with collective requests in grid systems. Journal for universal computer science, 2013, vol. 96, 282-300

Celotna bibliografija je dostopna na SICRISu: <http://sicris.izum.si/search/rsr.aspx?lang=slv&id=9241>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Robotika in računalniško zaznavanje
Course title:	Robotics and Machine Perception

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	3	zimski
Professional study program Computer and Information Science, 1st cycle	none	3	fall

Vrsta predmeta / Course type izbirni predmet /elective course

Univerzitetna koda predmeta / University course code: 63739

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer: izr. prof. dr. Danijel Skočaj

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

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

Vpis naslednjih predmetov iz predhodnih semestrov:

- Računalniška grafika
- Umetna inteligenca

The following subjects from previous semesters:

- Computer Graphics
- Artificial Intelligence

Vsebina:

Content (Syllabus outline):

Vsebina predmeta:

- Uvod
 - splošni pojmi
 - primeri aplikacij
- Senzorji
 - kamera, model kamere, kalibracija kamere, zajem slik
 - globinski senzorji, kalibracija, zajem 3-D informacije
 - haptični senzorji
- Procesiranje slik in računalniški vid
 - histogram
 - odpravljanje šuma in filtriranje slik
 - iskanje robov in kotov
 - detekcija enostavnih krivulj
 - morfološki operatorji, upragovljanje in segmentacija slik
 - ujemanje slik
- 3D geometrija, stereoskopski vid
- Robotika
 - uvod v robotiko
 - homogene transformacije
 - geometrijski model robota
- Mobilna robotika
- Spoznavna robotika

Predmet bo usmerjen k spoznavanju principov delovanja, metod in tehnologij s področja umetnega zaznavanja in robotike. Poudarek bo na razvoju praktičnih, delujočih rešitev. Vaje bodo temu prilagojene, izvajale pa se bodo v računalniški učilnici opremljeni z ustrezno strojno in programsko opremo.

Course topics:

1. Introduction
 - General concepts
 - Examples of applications
2. Sensors
 - Camera, camera model, camera calibration, image acquisition
 - Range sensors, calibration, acquisition of 3-D information
 - Haptic sensors
3. Image processing and computer vision
 - Histogram
 - Noise reduction and image filtering
 - Edge and corner detection
 - Detection of simple curves
 - Morphological operators, thresholding, and image segmentation
 - Image matching
4. 3D geometry, stereo vision
5. Robotics
 - Introduction to robotics
 - Homogeneous transformations
 - Forward kinematics
6. Mobile robotics
7. Cognitive robotics

The course is directed towards understanding of the main principles, methods, and technologies from the fields of machine perception and robotics. Emphasis will be on developing practical, operational solutions. The practice classes will facilitate such kinds of hands-on work; they will take place in a classroom with suitable software and hardware equipment.

Temeljni literatura in viri / Readings:

- Wilhelm Burger, Mark J. Burge. Digital Image Processing, Springer, 2008.
- Tadej Bajd, Osnove robotike, Založba FE in FRI, Ljubljana 2002.

Cilji in kompetence:

Cilj predmeta je študente seznaniti s temeljnimi znanji s področja umetnega zaznavanja ter robotike. Spoznali naj bi principe delovanja robotov ter sistemov računalniškega vida in se naučili razvijati podobne sisteme ter jih uporabljati v praksi.

Študentje bodo pridobili sposobnost razumevanja in reševanja strokovnih izzivov na področju računalništva in informatike in samostojnega opravljanja inženirskih nalog na področju strojnega vida, kjer bodo sposobni samostojnega reševanja specifičnih dobro opredeljenih nalog.

Objectives and competences:

The course aims at acquainting students with fundamental knowledge from the fields of machine perception and robotics. The students will learn the main principles of robotics and computer vision and learn how to develop such systems and use them in practice.

The students will acquire the ability to understand and solve professional challenges in computer science and to independently perform engineering tasks in the specific field of machine vision and independently solve specific well-defined tasks from this area.

Predvideni študijski rezultati:

Znanje in razumevanje:

Poznavanje temeljnih principov in metod umetnega zaznavanja in robotike. Sposobnost zasnovane in razvoja preprostih robotskih sistemov ter sistemov računalniškega vida.

Uporaba:

Uporaba metod s področja umetnega zaznavanja in robotike, načrtovanje preprostih sistemov ter implementacija teh sistemov za reševanje praktičnih problemov.

Refleksija:

Razumevanje primernosti teoretičnih metod za reševanje praktičnih primerov ter njihovih omejitev, sposobnost analitičnega razmišljanja, sposobnost analize in reševanja praktičnih problemov z razvojem robotskih sistemov ter sistemov računalniškega vida.

Prenosljive spretnosti - niso vezane le na en predmet:

Multidisciplinarni pristop, spretnosti iskanja in uporabe domače in tuje literature, uporaba primerne programske in strojne opreme, identifikacija in reševanje problemov.

Intended learning outcomes:

Knowledge and understanding:

Knowledge of the basic principles and methods of machine perception and robotics. Ability to design and develop simple robot and computer vision systems.

Application:

Application of methods from the fields of machine perception and robotics, design and implementation of simple systems for solving practical problems.

Reflection:

Understanding of both, the appropriateness of and the limitation of theoretical methods for solving practical problems, analytical reasoning, analysis and development of practical problems by development of robot and computer vision systems.

Transferable skills:

Multidisciplinary approach, skills for searching and using the literature, the use of the appropriate software and hardware, problem identification and solving.

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Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja s podporo avdio-vizualne opreme, laboratorijske vaje v računalniški učilnici z ustrezno strojno in programsko opremo. Delo posamezno in v skupinah. Veliko poudarka na praktični realizaciji naučenih principov.

Lectures with the appropriate audio-visual equipment in a classroom with suitable hardware and software. Individual and group work. Emphasis on hands-on work and problem solving.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, midterm exams, project work)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail</p> <p>(according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

<p>Pet najpomembnejših del:</p> <p>Fidler S, Skočaj D, Leonardis A. Combining reconstructive and discriminative subspace methods for robust classification and regression by subsampling. <i>IEEE trans. pattern anal. mach. intell.</i>, Mar. 2006, vol. 28, no. 3, str. 337-350</p> <p>Skočaj D, Leonardis A, Bischof H (2007) Weighted and robust learning of subspace representations. <i>Pattern Recogn</i> 40 (5): [1556]-1569.</p> <p>Skočaj D, Leonardis A. Incremental and robust learning of subspace representations. <i>Image vis. comput.</i>, 2008, vol. 26, no. 1, str. 27-38</p> <p>JL Wyatt, Aydemir A, Brenner M, Hanheide M, Hawes N, Jensfelt P, Kristan M, Kruijff G-J M, Lison P, Pronobis A, Sjöo K, Vrečko A, Zender H, Zillich M, Skočaj D (2010) Self-understanding and self-extension: a systems and representational approach. <i>IEEE Trans Auton Ment Dev</i> 2(4): 282-303</p> <p>Skočaj D, Kristan M, Vrečko A, Leonardis A, Fritz M, Stark M, Schiele B, Hongeng S, Wyatt JL. Multi-modal learning. V: <i>Cognitive systems</i>, (Cognitive systems monographs, vol. 8). Berlin; Heidelberg: Springer, cop. 2010, str. 265-309</p>
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Celotna bibliografija je dostopna na SICRISu: <http://sicris.izum.si/search/rsr.aspx?lang=slv&id=10425>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Tehnologija iger in navidezna resničnost
Course title:	Game Technology and Virtual Reality

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	3	zimski
Professional study program Computer and Information Science, 1st cycle	none	3	fall

Vrsta predmeta / Course type izbirni predmet /elective course

Univerzitetna koda predmeta / University course code: 63740

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer: izr. prof. dr. Peter Peer

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

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

Vpis naslednjih predmetov iz predhodnih semestrov je predpogoj:

- Računalniška grafika
- Umetna inteligenca

The following subjects from previous semesters are prerequisites:

- Computer Graphics
- Artificial Intelligence

Vsebina:

Predavanja:

- Uvod v igre, navidezne svetove, razkritje motivacije, dokument koncepta igre
- Pogon XNI, projekt in dokumentacija
- Izris (glavna zanka igre, sprajti, slikovni atlas, optimizacija izrisa; arhitektura igre, agilen razvoj, objekti, kompozicija, animacija)
- Premikanje (vhodni vmesniki, premiki na osnovi fizike, vidnost objektov, kamera, stožčasto izbiranje, graf scene, trki, teorem ločitvene osi)
- Igralnost (definicija, evalvacija, obvladovanje, splošna pravila igre, pravila integrirana v objekte; načrtovalski vzorci, (de)serializacija)
- Odzivni agenti in umetna inteligenca (zaznavanje, razmišljanje, odziv, tabelarično gnani agent, enostavni odzivni agent, agent z modelom, ciljno usmerjen agent, predstavitev preiskovalnega prostora, preiskovalni algoritmi)
- Meniji (GUI, kontrole, WIMP, HUD, principi grafičnega oblikovanja, principi načrtovanja uporabniškega vmesnika)
- Zvok (osnove, integracija v pogon igre, 3D zvok, odmev, odboj, okluzija, učinki okolja, glasba)
- 3D izris (matrika sveta, matrika pogleda, projekcijska matriko, matrika ohranjanja razmerij, primitivi, poligoni, senčenje, senčilniki, viri svetlobe)
- Rotacija in 3D fizika
- Scenarij, distribucija, oglaševanje (tehnike pripovedovanja, predzgodba, tipi zasnove scenarijev, interaktivnost zgodbe, distribucijski kanali, razrez dohodka)

Content (Syllabus outline):

Lectures:

1. Introduction to games, virtual worlds, revealing of motivation, game concept document
2. XNI engine, project, and documentation
3. Principles of drawing (game loop, sprites, sprite atlas, sprite batch; game architecture, agile development, objects, composition, animation)
4. Motion (input interfaces, physics based motion, visibility of objects, camera, frustum culling, scene graph, collisions, separating axis theorem)
5. Gameplay (definition, evaluation, management, general game rules, objects game rules; design patterns, (de)serialization)
6. Agents and artificial intelligence (sense-think-act cycle, table-driven agent, simple reflex agent, model-based reflex agent, goal-based agent, presentation of the search space, pathfinding algorithms)
7. Menus (GUI, controls, WIMP, HUD, graphic design principles, user interface design principles)
8. Sound (basics, integration into the game engine, 3D sound, echo, reverberation, occlusion, environmental effects, music)
9. Drawing in 3D (world matrix, view matrix, projection matrix, viewport matrix, primitives, polygons, shading, shaders, light sources)
10. Rotations and 3D physics
11. Scenario, distribution, advertising (narration techniques, backstory, plot types, story interactivity, distribution channel, game

<p>prodaje igre, pristopi k monetizaciji, pomen oglaševanja)</p> <p>Vaje:</p> <p>Osnova vaj so praktične razlage s primeri na lastnem pogonu XNI, s čimer bomo utrjevali snov in bolj podrobno obdelali izbrane teme predavanj. Študentje bodo reševali naloge, ki bodo skozi tedne semestra gradile njihov končni izdelek, igro. Cilj vsakega izdelka je objava.</p>	<p>income segmentation, monetization, importance of advertising)</p> <p>Tutorials:</p> <p>Work is based on practical examples, working demos, code snippets, using our own XNI engine. With them we strengthen the linkage between theory and practice. On a weekly bases students have assignments, which build their individual course project, a game. The goal of each project is publication of the game.</p>
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Temeljni literatura in viri / Readings:

<ul style="list-style-type: none"> • Introduction to Game Development by Steve Rabin (glavna, izhodiščna literatura / primary literature) • Artificial Intelligence: A Modern Approach by Stuart Russell, Peter Norvig • 3D Game Programming Using DirectX10 and OpenGL by Pierre Rautenbach <p>Ostalo/rest:</p> <ul style="list-style-type: none"> • Data Structures and Algorithms for Game Developers by Allen Sherrod • AI Game Engine Programming by Brian Schwab • Mathematics and Physics for Programmers by Danny Kodicek • Rules of Play: Game Design Fundamentals by Katie Salen, Eric Zimmerman • Game Development Essentials: An Introduction by Jeannie Novak
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Cilji in kompetence:

<p>Osnovni cilj predmeta je razložiti kompleksnost iger in njihovih navidezni svetov. Nadgradimo in integriramo znanje iz računalniške grafike in umetne inteligence. Študent razume cevovod nastajanja igre, njene arhitekturne dele ter zna razviti vsak del igre, kar potrdi z razvojem lastne igre.</p> <p>Splošne kompetence:</p> <ul style="list-style-type: none"> - Zmožnost kritičnega razmišljanja. - Zmožnost definirati, razumeti in rešiti kreativne strokovne izzive na področju računalništva in informatike. - Zmožnost apliciranja pridobljenega znanja pri samostojnem delu, ki vključuje reševanje tehničnih problemov na področju računalništva in informatike; zmožnost nadgrajevanja pridobljenega znanja.

Objectives and competences:

<p>The basic goal of the course is to explain the complexity of games and their virtual worlds. We build on knowledge gained at computer graphics and artificial intelligence courses. Student understands game pipeline, which are the architectural parts of the game and how they are connected into the game, also from the practical point of view by working on his own game.</p> <p>General competences:</p> <ul style="list-style-type: none"> - Ability of critical thinking. - The ability to define, understand and solve creative professional challenges in computer and information science. - The ability to apply acquired knowledge in independent work for solving technical problems in computer and information science; the ability to upgrade acquired knowledge.
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Predmetno specifične kompetence:

- Zmožnost prenosa znanja sodelavcem v tehnoloških ekipah.
- Veščine in praktično znanje o strojni opremi, programski opremi in informacijski tehnologiji, ki je potrebna za uspešno strokovno delo na področju računalništva in informatike.
- Zmožnost samostojnega dela na področju lažjih in kompleksnejših inženirskih in organizacijskih nalog na določenih ožjih segmentih in zmožnost samostojnega reševanja specifičnih, dobro definiranih nalog na področju računalništva in informatike.

Subject specific competences:

- The ability to transmit knowledge to co-workers in technology groups.
- Practical knowledge and skills of computer hardware, software and information technology necessary for successful professional work in computer and information science.
- The ability to independently perform both less demanding and complex engineering and organisational tasks in certain narrow areas and independently solve specific well-defined tasks in computer and information science.

Predvideni študijski rezultati:

Znanje in razumevanje:

Poleg deklarativnega znanja o gradnikih igre, bo poudarek na razumevanju osnovnih segmentov s praktičnega vidika, gradnji lastne igre.

Uporaba:

Zmožnost definiranja potreb igre, ocenitve njene kompleksnosti, razvoja in razširjanja. Poudarek je na ustreznem razvoju.

Refleksija:

Študent dobi občutek dobrega zrcaljenja teoretičnih načel tehnologije iger v prakso.

Prenosljive spretnosti - niso vezane le na en

predmet:

Tehnologija iger služi kot povezovalni element kopice ostalih področij računalništva ter to znanje dopolnjuje z igram specifično vsebino.

Intended learning outcomes:

Knowledge and understanding:

Beside declarative knowledge about the architectural parts of the game, the focus is on understanding these parts from the practical point of view, implementing one's own game.

Application:

Defining the gameplay, design, architecture of the game. Appropriate game implementation.

Reflection:

Student sees the mirroring of theoretical principles of game technology into practice.

Transferable skills:

The course binds together a number of computer science fields and complements the knowledge with game specific content.

Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja podajajo osnovne zakonitosti, vaje jih vpeljujejo v prakso. Vaje imajo laboratorijski značaj. Tedenske naloge pripeljejo do projekta celovite igre. Zaradi veliko praktičnega dela, so vaje tudi posnete.	Lectures give basic concepts, tutorial further enlighten their practical value. Tutorials have laboratory sessions characteristic. Weekly assignments lead to game project. Due to a lot of practical work, the tutorials are also captured on video.
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):		Type (examination, oral, coursework, project):
Sprotno preverjanje znanja (naloge na vajah, projekt)	67%	Continuous assessment (weekly assignments, project)
Končno preverjanje (pisni ali ustni izpit)	33%	Final examination (written or oral exam)
Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).		Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:

Pet najpomembnejših del / Five selected publications:

- PEER, Peter, EMERŠIČ, Žiga, BULE, Jernej, ŽGANEC GROS, Jerneja, ŠTRUC, Vitomir. Strategies for exploiting independent cloud implementations of biometric experts in multibiometric scenarios. *Mathematical problems in engineering*, ISSN 1024-123X. [Print ed.], 13 Mar. 2014, vol. 2014, str. 1-15.
- KOVAČ, Jure, PEER, Peter. Transformation based walking speed normalization for gait recognition. *Transactions on internet and information systems*, ISSN 1976-7277, Nov. 2013, vol. 7, no. 11, str. 2690-2701.
- P. Peer, F. Solina, Where physically is the optical center?, *Pattern Recognition Letters* 27(10), pp. 1117-1121, 2006.
- L. G. Corzo, J. A. Penaranda, P. Peer, Estimation of a fluorescent lamp spectral distribution for color image in machine vision, *Machine Vision and Application* 16(5), pp. 306-311, 2005.
- P. Peer, F. Solina, Panoramic Depth Imaging: Single Standard Camera Approach, *International Journal of Computer Vision* 47(1/2/3), pp. 149-160, 2002.

Celotna bibliografija je dostopna na COBISSu / Whole bibliography is available in COBISS:

<http://splet02.izum.si/cobiss/bibliography?langbib=eng&li=en&homelang=svn&code=19226>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Odločitveni sistemi
Course title:	Decision Systems

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	3	zimski
Professional study program Computer and Information Science, 1st cycle	none	3	fall

Vrsta predmeta / Course type izbirni predmet /elective course

Univerzitetna koda predmeta / University course code: 63741

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
45	10	20	/	/	105	6

Nosilec predmeta / Lecturer: viš. pred. dr. Aleksander Sadikov

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

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

Vpis naslednjih predmetov iz predhodnih semestrov:

- Podatkovno rudarjenje

The following subjects from previous semesters:

- Data Mining

Vsebina:

- večparametrsko odločanje in vrednotenje
- volilni sistemi, Arrowsov paradoks
- sistemi za podporo odločanju (HiView, DEXi, ...)
- lupine ekspertnih sistemov
- gradnja ekspertnih sistemov, Feigenbaumovo ozko grlo
- aplikacija odkrivanja zakonitosti v podatkih pri odločanju
- analiza stroškov in koristi
- odločitvena drevesa
- priporočilni sistemi

Content (Syllabus outline):

- multi-criteria decision making
- voting systems, Arrow's paradox
- decision support systems (HiView, DEXi, etc.)
- expert system shells
- building expert systems, Feigenbaum's bottleneck
- application of data mining for decision making
- costs and benefits analysis
- decision trees
- recommender systems

Temeljni literatura in viri / Readings:

1. Bohanec, M.: Odločanje in modeli, DMFA, 2006.
2. Mallach, E.G.: Understanding Decision Support Systems and Expert Systems, Irwin, 1994.
3. Jannach, D. et al.: Recommender Systems: An Introduction, Cambridge University Press, 2010.

Cilji in kompetence:

Cilj predmeta je študentom računalništva in informatike predstaviti osnove teorije odločanja ter računalniške pripomočke za odločanje oz. gradnjo odločitvenih modelov in priporočilnih sistemov. Naučiti študente te pripomočke in modele pravilno uporabljati za podporo odločanju v praksi.

Objectives and competences:

The objective is to demonstrate the basics of the decision theory and computer software for construction of decision models, decision making, and recommender systems to the students of computer science, and to teach them how to use it effectively in practical decision making.

Predvideni študijski rezultati:

<p>Znanje in razumevanje:</p> <p>Poznavanje osnov teorije odločanja. Razumevanje delovanja in prednosti ter slabosti sistemov za podporo odločanju.</p> <p>Uporaba:</p> <p>Uporaba programskih sistemov in modelov za podporo odločanju ter priporočilnih sistemov na realnih problemih v praksi.</p> <p>Refleksija:</p> <p>Spoznavanje in razumevanje uglasenosti med teorijo in njeno aplikacijo na konkretnih primerih uporabe sistemov za podporo odločanju.</p> <p>Prenosljive spretnosti - niso vezane le na en predmet:</p> <p>Spretnost zbiranja in interpretiranja podatkov ter uporabe naučenih/zgrajenih modelov. Identifikacija aplikacij uporabe v praksi in problemov (tudi na drugih področjih). Odločanje v skupinah, kritično razmišljanje in analiza.</p>

Intended learning outcomes:

<p>Knowledge and understanding:</p> <p>Basic knowledge of decision theory and a grasp on how decision support software works, its advantages and weaknesses.</p> <p>Application:</p> <p>Real life use of decision support software, decision models, and recommender systems.</p> <p>Reflection:</p> <p>Learning and understanding how the theory and practice of decision making are intertwined and real life application of decision theory in decision support software.</p> <p>Transferable skills:</p> <p>The art of gathering and interpreting data and application of induced (decision) models. Identification of possible applications (also in other fields). Group decision making, critical thinking and analysis.</p>

Metode poučevanja in učenja:

<p>Predavanja, seminarji, vodeni individualni študij, laboratorijske vaje, nastopi. Poudarek je na praktičnih primerih uporabe.</p>

Learning and teaching methods:

<p>Lectures, seminars, co-ordinated individual study, practical classes, individual presentations. The emphasis is on practical use cases.</p>
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, midterm exams, project work)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 5 fail</p>
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		(according to the rules of University of Ljubljana).
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

Celotna bibliografija je dostopna na SICRISu: <http://sicris.izum.si/search/rsr.aspx?lang=slv&id=12278>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Numerične metode
Course title:	Numerical Methods

Študijski program in stopnja	Študijska smer	Letnik	Semester
Study programme and level	Study field	Academic year	Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	3	zimski
Professional study program Computer and Information Science, 1st cycle	none	3	fall

Vrsta predmeta / Course type izbirni predmet /elective course

Univerzitetna koda predmeta / University course code: 63742

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samost. delo	ECTS
Lectures	Seminar	Tutorial	Laboratory work	Field work	Individ. work	
45	/	30	/	/	105	6

Nosilec predmeta / Lecturer: prof. dr. Bojan Orel

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

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

Prerequisites:



Vsebina:

Predavanja:

- Približno računanje in vloga napak pri numerični matematiki;
- Sistemi linearnih enačb: Gausova eliminacija in LU razcep, občutljivost, iterativne metode;
- Reševanje nelinearnih enačb: bisekcija, regula falsi, sekantna, Newtonova in metoda fiksne točke;
- Aproksimacija in interpolacija: Lagrangeov in Newtonov interpolacijski polinom, aproksimacija po metodi najmanjših kvadratov;
- Numerično integriranje: trapezna in Simpsonova metoda, avtomatično prilagajanje koraka, Rombergova metoda, diferenčne formule;
- Modeliranje dinamike: zvezni procesi kot diferencialne enačbe in diskretni procesi kot diferenčne enačbe, Eulerjeva metoda, Adamsove metode, metode Runge-Kutta, avtomatično prilagajanje dolžine koraka.

Vaje:

Na vajah se bodo študenti pri reševanju konkretnih problemov pod vodstvom asistenta učili uporabljati primerna računalniška orodja. Udeležba na vajah je obvezna.

Domače naloge:

Namen domačih nalog je usmeriti študenta na uporabo znanja, pridobljenega na predavanjih pri reševanju uporabnih problemov. Študentje domače naloge rešujejo individualno.

Content (Syllabus outline):

Lectures:

- ⤴ Approximate computing and the role of errors in numerical mathematics;
- ⤴ Systems of linear equations: Gaussian elimination and LU decomposition, sensitivity, iterative methods;
- ⤴ Solving nonlinear equations: bisection, regula falsi, secant, Newton's and fixed point methods;
- ⤴ Approximation and interpolation: Newton and Lagrange polynomial, least squares approximation;
- ⤴ Numerical integration: trapezoid and Simpson methods, automatic step-size control, Romberg method, difference formulae;
- ⤴ Modelling dynamics: continuous processes such as differential equations and discrete processes such as differential equations, Euler's method, Adams method, Runge-Kutta methods, automatic step-size control.

Lab practice:

At the Lab sessions the students will solve practical problems under the guidance of assistant and learn to use appropriate tools. Attendance at tutorials is compulsory.

Homeworks:

The purpose of homeworks is to direct students to use knowledge gained in lectures to solve practical problems. Students solve homework individually. The obligation of each student to solve and successfully defend three homework assignments (a

Obveznost vsakega študenta je rešiti in uspešno zagovarjati tri domače naloge (pogoj za pristop k izpitu). Ocena domačih nalog predstavlja polovico izpitne ocene.

condition for the admission to the exam). Evaluation of homework is half of the final grade.

Temeljna literatura in viri / Readings:

- Bojan Orel: Osnove numerične matematike
- K. Atkinson: Elementary Numerical Analysis
- T. J. Akai: Numerical Methods

Cilji in kompetence:

Cilj predmeta je seznaniti študente z numeričnimi metodami in jih usposobiti, da bodo lahko te metode uporabljali pri računalniškem modeliranju različnih pojavov v naravoslovju, tehniki in na drugih področjih.

Objectives and competences:

The course aims to acquaint students with numerical methods and train them to use these methods in computer modelling of various phenomena in science, technology and other fields.

Predvideni študijski rezultati:

Znanje in razumevanje:

Sposobnost razumevanja in reševanja poklicnih izzivov v računalništvu in matematiki.

Uporaba:

Sposobnost uporabe pridobljenega znanja v samostojnem delu pri reševanju tehničnih in znanstvenih problemov v računalništvu in informatiki; sposobnost nadgrajevanja pridobljenega znanja.

Refleksija:

Spoznavanje uporabnosti matematičnih modelov za konsistentno in natančno opisovanje pojavov.

Intended learning outcomes:

Knowledge and understanding:

The ability to understand and solve professional challenges in computer and information science.

Application:

The ability to apply acquired knowledge in independent work for solving technical and scientific problems in computer and information science; the ability to upgrade acquired knowledge.

Reflection:

Understanding the usefulness of mathematical models to consistently and accurately describe the phenomena.

Prenosljive spretnosti - niso vezane le na en predmet:

Sposobnost razumeti in uporabiti znanje iz računalništva in informatike na druga ustrezna področja (ekonomija, naravoslovje, tehnika, itd).

Transferable skills:

The ability to understand and apply computer and information science knowledge to other technical and relevant fields (economics, science, technical science, etc).

Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja, vaje z uporabo programa Matlab, domače naloge. Poseben poudarek je na sprotne študiju z domačimi nalogami in na sodelovanju pri vajah.

Lectures, lab practice using Matlab program, homeworks. Particular emphasis is on a continuous with homeworks and active participation lab sessions.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, midterm exams, project work)</p> <p>Final (written and oral exam)</p> <p>Grading: 6-10 pass, 1-5 fail</p> <p>(according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:

Pet najpomembnejših del:

1. OREL, Bojan. Extrapolated Magnus methods. *BIT (Nord. Tidskr. Inf-Behandl.)*, 2001, vol. 41, no. 5, str. 1089-1100. [COBISS.SI-ID [11459929](#)]
2. CALLEDONI, Elena, ISERLES, Arieh, NØRSETT, Syvert Paul, OREL, Bojan. Complexity theory for Lie-group solvers. *J. complex.*, 2001, vol. 18, no. 1, str. 242-286. [COBISS.SI-ID [11529305](#)]
3. TURKOVIĆ, Aleksandra, OREL, Bojan, LUČIĆ-LAVČEVIĆ, Magdi, DUBČEK, Pavo, PAVLOVIĆ, Mladen, CRNJAK OREL, Zorica, BERNSTORFF, Sigrid. GISAXS study of temperature evolution in

nanostructured CeVO [sub] 4 films. *Sol. energy mater. sol.cells.* [Print ed.], 2007, vol. 91, no. 14, str. 1299-1304. [COBISS.SI-ID [3749658](#)]

4. OREL, Bojan. Accumulation of global error in Lie group methods for linear ordinary differential equations. *Electron. trans. numer. anal.*, 2010, vol. 37, str. 252-262. <http://etna.mcs.kent.edu/>. [COBISS.SI-ID [15731801](#)]

5. LUČIĆ LAVČEVIĆ, Magdi, TURKOVIĆ, Aleksandra, DUBČEK, Pavo, CRNJAK OREL, Zorica, OREL, Bojan, BERNSTORFF, Sigrid. GISAXS view of induced morphological changes in nanostructured CeVO [sub] 4 thin films. *J. nanomater.*, 2011, vol. 2011, str. 303808-1-303808-7, ilustr. <http://174.129.233.187/journals/jnm/2011/303808.cta.html>, doi: [10.1155/2011/303808](https://doi.org/10.1155/2011/303808). [COBISS.SI-ID [4561690](#)]

Celotna bibliografija je dostopna na SICRISu: <http://sicris.izum.si/search/rsr.aspx?lang=slv&id=6758>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Računalništvo v praksi I
Course title: Computer science in practice I

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2	zimski, poletni
Professional study program Computer and Information Science, 1st cycle	none	2	fall, spring

Vrsta predmeta / Course type izbirni predmet / elective course

Univerzitetna koda predmeta / University course code: 63752

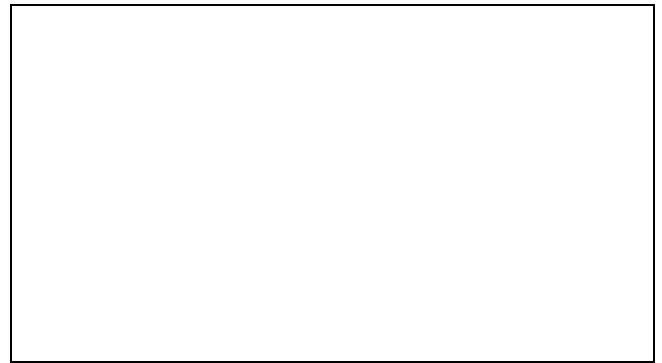
Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
5	/	/	/	40	45	3

Nosilec predmeta / Lecturer: prodekan za pedagoško dejavnost FRI/vice dean for education

Jeziki / Predavanja / Lectures: slovenščina, angleščina
Languages: Slovene, English
Vaje / Tutorial: slovenščina, angleščina
 Slovene, English

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

Prerequisites:

**Vsebina:**

Na uvodnih predavanjih študentom pojasnimo cilje predmeta in kako jih lahko dosežejo. Med aktivnosti, ki jih lahko štejemo kot obveznosti pri predmetu, sodijo sodelovanje pri izdelavi skupinskega projekta ali celoviti rešitvi problema s področja računalništva in informatike, predstavitev rešitve in ustrezna dokumentacija oziroma poročilo. Primeri problemov ali projektov lahko pokrivajo cel spekter vsebin: od povsem realno uporabnih – na primer dokumentiran in objavljen prispevek k večjemu v mednarodni skupnosti priznanemu odprtokodnemu projektu, predmetno tutorstvo, priprave in vodenja računalniškega krožka na osnovni ali srednji šoli do strokovne pomoči pri računalniških tekmovanjih.

VSEBINA

- **Skupinsko delo:** skupinski projekt, individualni projekt, vloge v skupini, dokumentacija v skupinskem delu
- **Analiza zahtev:** zajem in analiza zahtev končnega uporabnika – naročnika ali stranke, funkcionalne in nefunkcionalne zahteve, specifikacija in validacija zahtev, upravljanje sprememb
- **Upravljanje projekta:** strategije, orodja, nadzor kakovosti, testiranje rezultata.
- **Dokumentacija:** tehnična, uporabniška, on-line, nadaljnja podpora.
- **Praktično delo v skupini**

Content (Syllabus outline):

After an introductory lecture on the necessary background of the activities involved in the course, the students' activities include participation in a group project or the solution of a suitable problem from the field of computer and information science, presentation of the solution including all documentation or a written report. Examples of suitable problems or projects range from documented and published contributions to open internationally acknowledged open source projects, classes and lab work with students of primary or secondary schools, tutoring work at lower level courses.

CONTENTS

- **Team work:** team projects, individual projects tasks in a team, documenting team
- **Analysis of task specifications:** obtaining and analyzing specifications of the final consumer, functional and nonfunctional specifications, validation, managing modifications
- **Project management:** strategies, tools, quality control, testing.
- **Documentation:** technical, user, on-line, support.
- **Practical team work**

Temeljni literatura in viri / Readings:

- M Holcombe and F Ipage: Correct Systems: building business process solutions. Springer
- I Somerville: Software Engineering Addison-Wesley
- R S Pressman: Software Engineering: A Practitioner's Approach. McGraw-Hill
- Vicens Q, Bourne PE (2007) Ten simple rules for a successful collaboration, PLoS Computational Biology 3(3): e44.
- Požarnik, B.M.: Psihologija pouka in učenja, Državna založba Slovenije, Ljubljana, 2000, (str. 151-21)

Cilji in kompetence:

Cilj predmeta je študentom omogočiti in s kreditnimi točkami ovrednotiti njihovo izven kurikularno strokovno, nepridobitno delo, ki je za profesionalno profiliranje strokovnjaka na področju računalništva in informatike potrebno, a ga učni načrt sicer ne pokriva. Med pri predmetu pridobljene specifične kompetence štejemo sposobnost celovite obdelave manjših projektov in reševanja problemov iz prakse s področja računalništva in informatike, sodelovanje pri skupinskem reševanju problemov, vodenja manjše skupine, pripravo gradiv, ki so za vodenje take skupine potrebna, organizacijo in pridobivanje znanj, ki so potrebni za delo skupine, pripravo terminskega in vsebinskega načrta za delo skupine itd.

Cilji predmeta so zlasti

- Pridobiti izkušnje pri delu na realnih projektih in problemih
- Pridobiti izkušnje pri delu s končnimi strankami ali naročniki
- Naučiti se izbrati primerno orodje in tehnologijo za reševanje konkretnega problema
- Razvijati sposobnosti za delo v skupini in izkusiti delo v skupini
- Razvijati sposobnosti za posredovanje mlajšim in popularizacijo računalniških znanj in veščin.

Objectives and competences:

The object of this course is to provide a framework for awarding study credit for extracurricular non-profit activities of students related to computer and information science that are not included in the curriculum of the study program and are necessary for a well formed expert in the field. Among the specific competences provided by this course are the ability to complete smaller practical projects in and solve problems in the fields of computer and information science, participating in group solutions, organizing and supervising the work of a smaller group including the preparation of the necessary materials.

The specific goals of the course are

- Experience in work on practical projects and problems
- Experience with work with clients
- Obtaining the knowhow to choose the suitable tools and technologies for a specific problem
- Developing the ability and experience with team work
- Developing teaching skills and means for popularizing computer and information science topics and issues.

Predvideni študijski rezultati:

Znanje in razumevanje:

Spoznavanje osnovnih zakonitosti pri posredovanju znanja in popularizaciji računalniškega področja manjši skupini predvsem mlajših članov, organizaciji njenega dela in razumevanje pomena

Intended learning outcomes:

Knowledge and understanding:

Basic educational principles and teaching practice in the process of introducing computer science topics to smaller groups of younger students, organization of group work, understanding the role of such

in uporabe takih znanj pri strokovnem delu strokovnjaka na področju računalništva in informatike.

competencies in the work of an expert in the field of computer and information science.

Metode poučevanja in učenja:

Predavanja, mentorski in seminarski način dela ter spremljanja dela študenta, z ustnim nastopom ob zaključku semestra. Poseben poudarek je na skupinskem delu pri seminarjih.

Learning and teaching methods:

Lectures, individual work with students and smaller groups of students, seminars with oral presentations with special emphasis on group work.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

Sprotno preverjanje (domače naloge, kolokviji in projektno delo)

Končno preverjanje (pisni in ustni izpit)

Ocene: je opravil z odliko, opravil ali ni opravil (v skladu s Statutom UL).

50%

50%

Type (examination, oral, coursework, project):

Continuing (homework, midterm exams, project work)

Final (written and oral exam)

Grading: passed with excellence, passed or failed (according to the Statute of UL).

Reference nosilca / Lecturer's references:

1. FIJAVŽ, Gašper, WOOD, David Richard. Graph minors and minimum degree. The Electronic journal of combinatorics, ISSN 1077-8926. [Online ed.], 2010, vol. 17, no. 1, r151 (30 str.).

2. DUJMOVIĆ, Vida, FIJAVŽ, Gašper, JORET, Gwenaël, SULANKE, Thom, WOOD, David Richard. On the maximum number of cliques in a graph embedded in a surface. European journal of combinatorics, ISSN 0195-6698, 2011, vol. 32, no. 8, str. 1244-1252.

3. ALAM, Muhammad Jawaherul, CHAPLICK, Steven, FIJAVŽ, Gašper, KAUFMANN, Michael, KOBOUROV, Stephen G., PUPYREV, Sergey. Threshold-coloring and unit-cube contact representation of graphs. V: BRANDSTÄDT, Andreas (ur.), JANSEN, Klaus (ur.), REISCHUK, Rüdiger (ur.). Graph-theoretic concepts in computer science : 39th International Workshop, WG 2013, Lübeck, Germany, June 19-21, 2013 : revised papers, WG 2013, 39th International Workshop on Graph-Theoretic Concepts in Computer Science, June 19 - 21, 2013, Lübeck, Germany, (Lecture notes in computer science, ISSN 0302-9743, 8165). Heidelberg [etc.]: Springer. cop. 2013, str. 26-37.

4. FIJAVŽ, Gašper, PISANSKI, Tomaž, RUS, Jernej. Strong traces model of self-assembly polypeptide structures. MATCH Communications in Mathematical and in Computer Chemistry, ISSN 0340-6253, 2014, vol. 71, no. 1, str. 199-212.

5. FIJAVŽ, Gašper, NAKAMOTO, Atsuhiko. Odd complete minors in even embeddings on surfaces. Discrete Mathematics, ISSN 0012-365X. [Print ed.], 2016, vol. 339, iss. 1, str. 165-178.

Celotna bibliografija je dostopna na SICRISu:

<http://www.sicris.si/search/rsr.aspx?lang=slv&id=9390>.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Računalništvo v praksi II
Course title: Computer science in practice II

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	3	zimski, poletni
Professional study program Computer and Information Science, 1st cycle	none	3	fall, spring

Vrsta predmeta / Course type izbirni predmet / elective course

Univerzitetna koda predmeta / University course code: 63753

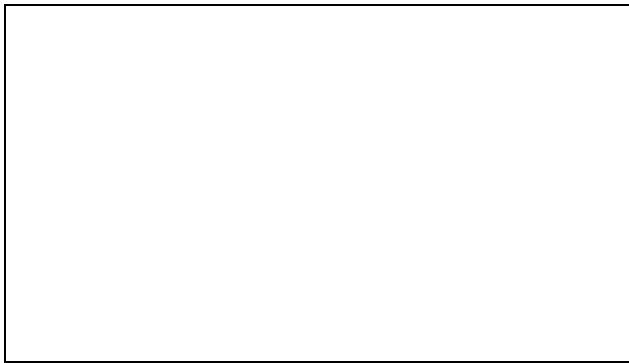
Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
5	/	/	/	40	45	3

Nosilec predmeta / Lecturer: prodekan za pedagoško dejavnost FRI/vice dean for education

Jeziki / Languages:	Predavanja / Lectures:	slovenščina, angleščina Slovene, English
	Vaje / Tutorial:	slovenščina, angleščina Slovene, English

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

Prerequisites:



Vsebina:

Na uvodnih predavanjih študentom pojasnimo cilje predmeta in kako jih lahko dosežejo. Med aktivnosti, ki jih lahko štejejo kot obveznosti pri predmetu, sodijo sodelovanje pri izdelavi skupinskega projekta ali celoviti rešitvi problema s področja računalništva in informatike, predstavitev rešitve in ustrezna dokumentacija oziroma poročilo. Primeri problemov ali projektov lahko pokrivajo cel spekter vsebin: od povsem realno uporabnih – na primer dokumentiran in objavljen prispevek k večjemu v mednarodni skupnosti priznanemu odprtokodnemu projektu, predmetno tutorstvo, priprave in vodenja računalniškega krožka na osnovni ali srednji šoli do strokovne pomoči pri računalniških tekmovanjih.

Predmet predstavlja nadgradnjo predmeta Računalništvo v praksi I, pri čemer poudarja zlasti vodenje skupine in specifične probleme in vodstvene strategije.

VSEBINA

- **Skupinsko delo:** skupinski projekt, individualni projekt, vloge v skupini, dokumentacija v skupinskem delu. Vodenje skupine.
- **Upravljanje projekta:** faze projekta, strategije, orodja, nadzor kakovosti, testiranje rezultata. Upravljanje s tveganji. Metodologije upravljanja projektov.
- **Izgradnja in vodenje skupine:** pomen skupinskega dela, upravljanje ljudi, potrebne komunikacijske spretnosti, motivacija članov, delo s strankami.
- **Praktično delo v skupini**

Content (Syllabus outline):

After an introductory lecture on the necessary background of the activities involved in the course, the students' activities include participation in a group project or the solution of a suitable problem from the field of computer and information science, presentation of the solution including all documentation or a written report. Examples of suitable problems or projects range from documented and published contributions to open internationally acknowledged open source projects, classes and lab work with students of primary or secondary schools, tutoring work at lower level courses. The course upgrades the subject material of Computer science in practice I, while further attention is given to team leadership and leadership strategies.

CONTENTS

- **Team work:** team projects, individual project's tasks in a team, documenting team
- **Analysis of task specifications:** obtaining and analyzing specifications of the final consumer, functional and nonfunctional specifications, validation, managing modifications
- **Project management:** strategies, tools, quality control, testing.
- **Documentation:** technical, user, on-line, support.
- **Practical team work**

Temeljni literatura in viri / Readings:

- S Berkun: The Art of Project Management (Theory in Practice) O'Reilly 2005
- T DeMarco, T Lister: Peopleware: Productive Projects and Teams. Dorset House Publishing. 1999.
- M Holcombe and F Ipaté: Correct Systems: building business process solutions. Springer
- Vicens Q, Bourne PE (2007) Ten simple rules for a successful collaboration, PLoS Computational Biology 3(3): e44.
- Keller Gustav, Binder Annette, Thiel Rolf Dietmar (1999). Boljša motivacija uspešnejše učenje; Trening učnih navad. Ljubljana: Center za psihodiagnostična sredstva.

Cilji in kompetence:

Cilj predmeta je študentom omogočiti in s kreditnimi točkami ovrednotiti njihovo izven kurikularno strokovno, nepridobitno delo, ki je za profesionalno profiliranje strokovnjaka na področju računalništva in informatike potrebno, a ga učni načrt sicer ne pokriva. Med pri predmetu pridobljene specifične kompetence štejemo sposobnost celovite obdelave manjših projektov in reševanja problemov iz prakse s področja računalništva in informatike, sodelovanje pri skupinskem reševanju problemov, vodenja manjše skupine, pripravo gradiv, ki so za vodenje take skupine potrebna, organizacijo in pridobivanje znanj, ki so potrebni za delo skupine, pripravo terminskega in vsebinskega načrta za delo skupine itd.

Objectives and competences:

The object of this course is to provide a framework for awarding study credit for extracurricular non-profit activities of students related to computer and information science that are not included in the curriculum of the study program and are necessary for a well formed expert in the field. Among the specific competences provided by this course are the ability to complete smaller practical projects in and solve problems in the fields of computer and information science, participating in group solutions, organizing and supervising the work of a smaller group including the preparation of the necessary materials.

Predvideni študijski rezultati:

Znanje in razumevanje:

Spoznavanje osnovnih zakonitosti pri posredovanju znanja in popularizaciji računalniškega področja manjši skupini predvsem mlajših članov, organizaciji njenega dela in razumevanje pomena in uporabe takih znanj pri strokovnem delu strokovnjaka na področju računalništva in informatike.

Intended learning outcomes:

Knowledge and understanding:

Basic educational principles and teaching practice in the process of introducing computer science topics to smaller groups of younger students, organization of group work, understanding the role of such competencies in the work of an expert in the field of computer and information science.

Metode poučevanja in učenja:

Learning and teaching methods:

Predavanja, mentorski in seminarski način dela ter spremljanja dela študenta, z ustnim nastopom ob zaključku semestra. Poseben poudarek je na skupinskem delu pri seminarjih.

Lectures, individual work with students and smaller groups of students, seminars with oral presentations with special emphasis on group work.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <p>Sprotno preverjanje (domače naloge, kolokviji in projektno delo)</p> <p>Končno preverjanje (pisni in ustni izpit)</p> <p>Ocene: opravil z odliko, opravil ali ni opravil (v skladu s Statutom UL).</p>	<p>50%</p> <p>50%</p>	<p>Type (examination, oral, coursework, project):</p> <p>Continuing (homework, midterm exams, project work)</p> <p>Final (written and oral exam)</p> <p>Grading: passed with excellence, passed or failed (according to the Statute of UL).</p>
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Reference nosilca / Lecturer's references:

1. FIJAVŽ, Gašper, WOOD, David Richard. Graph minors and minimum degree. The Electronic journal of combinatorics, ISSN 1077-8926. [Online ed.], 2010, vol. 17, no. 1, r151 (30 str.).
2. DUJMOVIĆ, Vida, FIJAVŽ, Gašper, JORET, Gwenaël, SULANKE, Thom, WOOD, David Richard. On the maximum number of cliques in a graph embedded in a surface. European journal of combinatorics, ISSN 0195-6698, 2011, vol. 32, no. 8, str. 1244-1252.
3. ALAM, Muhammad Jawaherul, CHAPLICK, Steven, FIJAVŽ, Gašper, KAUFMANN, Michael, KOBOUROV, Stephen G., PUPYREV, Sergey. Threshold-coloring and unit-cube contact representation of graphs. V: BRANDSTÄDT, Andreas (ur.), JANSEN, Klaus (ur.), REISCHUK, Rüdiger (ur.). Graph-theoretic concepts in computer science : 39th International Workshop, WG 2013, Lübeck, Germany, June 19-21, 2013 : revised papers, WG 2013, 39th International Workshop on Graph-Theoretic Concepts in Computer Science, June 19 - 21, 2013, Lübeck, Germany, (Lecture notes in computer science, ISSN 0302-9743, 8165). Heidelberg [etc.]: Springer. cop. 2013, str. 26-37.
4. FIJAVŽ, Gašper, PISANSKI, Tomaž, RUS, Jernej. Strong traces model of self-assembly polypeptide structures. MATCH Communications in Mathematical and in Computer Chemistry, ISSN 0340-6253, 2014, vol. 71, no. 1, str. 199-212.
5. FIJAVŽ, Gašper, NAKAMOTO, Atsuhiko. Odd complete minors in even embeddings on surfaces. Discrete Mathematics, ISSN 0012-365X. [Print ed.], 2016, vol. 339, iss. 1, str. 165-178.

Celotna bibliografija je dostopna na SICRISu:

<http://www.sicris.si/search/rsr.aspx?lang=slv&id=9390>.

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
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2,3	zimski
Professional study program Computer and Information Science, 1st cycle	none	2,3	fall

Vrsta predmeta / Course type izbirni / elective

Univerzitetna koda predmeta / University course code: 63750

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
				30	60	3

Nosilec predmeta / Lecturer: spec. Iztok Mihevc, prof.

Jeziki/sloven	Predavanja / Lectures:	/
Languages:	Vaje / Tutorial:	Slovenski/Slovene
Slovenski/ Slovene		

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

Prerequisites:

	As specified by internal acts of the University of Ljubljana and Faculty of Computer and Information Science.
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Vsebina:

<p>Predmet ŠV vključuje naslednje teoretične vsebine:</p> <ul style="list-style-type: none"> • uvod in opredelitev predmeta (vsebina in organizacija), • pomen in vloga predmeta ŠV kot vrednota kakovosti življenja v času študija in med opravljanjem poklica, • učinki športne aktivnosti na celovito telesno, duševno in socialno zdravje študentov, • športna aktivnost kot preventivna, korektivna in promocijska dejavnost za ohranjanje zdravja, • športni način življenja kot vodilo zdravega načina življenja, <p>Specialne teoretične vsebine so:</p> <ul style="list-style-type: none"> • Razlaga pravil in sodniških znakov. • Razlaga osnovnih značilnosti tehničnih elementov in osnov taktike. • Elementi skupinske taktike. <p>Velik poudarek je na praktičnih vajah, kjer študent izbira med ponujenimi športi (košarka, nogomet, odbojka, plavanje aktivnosti v naravi - gornišтво, smučanje, tek na smučeh).</p>
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Content (Syllabus outline):

<p>The subject of Sport education includes the following theoretical topics:</p> <ul style="list-style-type: none"> • introduction and definition of the object (content and organization) • meaning and role of physical education as a value in the quality of life during studies or work, • the effects of sports activities in the overall physical, mental and social health of students • sports activities as a preventive, corrective and promotional activity to maintain health, • sporting way of life as a guide to a healthy lifestyle <p>Specific theoretical contents consist of:</p> <ul style="list-style-type: none"> • rules and judging signs, • basic features and technical elements, and basic tactics, • elements of group tactics. <p>Strong emphasis is on practical work where students are offered a choice between different sports (basketball, soccer, volleyball, swimming, outdoor activities - climbing, skiing, cross country skiing).</p>
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Temeljni literatura in viri / Readings:

15. Temeljna literatura in viri:

Obvezna literatura:

1. Društvo za zdravje srca in ožilja Slovenije (2000). Lepota gibanja tudi za zdravje (izbrana poglavja). Ljubljana: Društvo za zdravje srca in ožilja Slovenije, 336 str.
2. Društvo za zdravje srca in ožilja Slovenije (1997). Prehrana - vir zdravja (izbrana poglavja). Ljubljana: Društvo za zdravje srca in ožilja Slovenije, 315 str.
3. Rotovnik-Kozjek, N. (2004). Gibanje je življenje (izbrana poglavja). Ljubljana: Domus, 238 str.

Priporočljiva literatura:

1. Thomas R. Beachle, Roger W. Earle (copyright 2000, 1994 by the National Strength and Conditioning Association) Essentials of strength training and conditioning
2. Berčič, H. et al. (2001). Šport v obdobju zrelosti. Ljubljana: Fakulteta za šport UL, Inštitut za šport, 210 str.
3. Bravničar, M.(1996) Fiziologija športa – harmonija med delovanjem in mirovanjem. Ljubljana: UL, FŠ, Inštitut za šport
4. CINDI Slovenija (2002). Krepimo zdravje z gibanjem in zdravo prehrano (mednarodna konferenca - Radenci). Ljubljana: CINDI Slovenija, 177 str
5. Dervišević, E., Vidmar, J., (2011). Vodič športne prehrane. Ljubljana: UL, Fakulteta za šport, 178 str.
6. Francis, P. R. (1996). Real exercise for real people : Finding your optimum level of physical activity for a life time of healthy living. Rocklin: Prima Pub,178 str.
7. Inštitut za varovanje zdravja Republike Slovenije (2000). Gibanje za zdravje (svetovni dan zdravja). Ljubljana: Inštitut za varovanje zdravja Republike Slovenije, 85 str.
8. Nancy Clark, Sportska prehrana; Izvori energije za vaš aktiven način življenja (2000). (prevod knjige Marija Paulus) – Zagreb: Gopal 2000
9. Pokorn, D. (1988). Gorivo za zmagovalce - prehrana športnika in rekreativca. Ljubljana: Inštitut za varovanje zdravja Republike Slovenije, 153 str.
10. Pistotnik, B.(2011). Osnove gibanja v športu, Osnove gibalne izobrazbe. Ljubljana: UL Fakulteta za šport, 163 str.
11. Russell, R. V. (1982). Planning programs in recreation. St. Louis, Toronto, London: The C. V. Mosby Company, 352 str.
12. Sharkey, B., J. (1997). Fitness and health (4th ed.). Champaign, Windsor, Leeds, Lower Mitcham, Auckland: Human Kinetics, 417 str.
13. Ušaj, A. (1997). Kratek pregled osnov športnega treniranja. Ljubljana: Fakulteta za šport UL, Inštitut za šport, 299 str.
14. specifična literatura glede na izbrane programe po posameznih športnih panogah oziroma druge programe.

Cilji in kompetence:

Cilji: Cilj predmeta so skozi organizirano in načrtno vodeno športno vadbo pri študentih vplivati na oblikovanje pozitivnih stališč do športa, ozaveščati o vrednotah športa, navajati na zdrav način življenja ter aktivno in ustvarjalno izrabo prostega časa, usmerjati v organizirane oblike športa na univerzi in širšem okolju, preventivno vplivati na posledice pomanjkanja gibanja, razvijati psihofizične

Objectives and competences:

The aim of this course is, through an organized and systematic training influence the students attitude towards sports and raise their awareness of the values in sport, show a healthy lifestyle and active and creative use of leisure time, guide towards an organized form of sport in the university and the wider environment, prevent the effect and the consequences of lack of exercise, develop physical and mental fitness and improve skills in selected individual sports.

sposobnosti in izpopolniti znanje v posameznih izbranih športnih panogah.

Kompetence:

- racionalno vgrajevanje športa v način življenja,
- oblikovanje razumskega in čustvenega odnosa do telesnega napora,
- poznavanje teorije aktivnega počitka,
- poznavanje opredelitev zdravega življenjskega sloga,
- obvladanje metod za regeneracijo telesa,
- poznavanje učinkov športne rekreacije na celovito zdravje,
- poznavanje zdravega prehranjevanja in regulacije telesne teže,
- poznavanje medicinskih vidikov športa,
- poznavanje posebnosti najpogostejših patologij gibalnega in kardio-vaskularnega sistema,
- osvajanje priljubljene športne panoge.

Competencies:

- incorporating sports as a way of life
- creating a rational and emotional relationship to the physical effort
- understanding the theory of active rest
- understanding the definition of a healthy lifestyle
- mastering methods for the regeneration of the body
- knowledge of the effects of recreation on overall health
- knowledge of healthy eating and weight control
- knowledge of medical aspects of sport
- knowledge of the specifics of the most common musculoskeletal pathologies and the cardio-vascular system,
- Acquisition of popular sports

Predvideni študijski rezultati:

Znanje in razumevanje: osvajanje vsebin športa kot temeljev, ki omogočajo kvaliteto življenja.

Uporaba: uporaba pridobljenega znanja za kompenzacijo vsakodnevnih stresov med študijem.

Refleksija: uporaba pridobljenega znanja za kompenzacijo vsakodnevnih stresov v poklicu in družini.

Prenosljive spretnosti : spretnosti pridobljene pri športu prispevajo k vzdržnosti in telesni pripravljenosti na študij in delo.

Intended learning outcomes:

Knowledge and understanding:

Sports activities as a foundation for the quality of life.

Application: using the acquired knowledge and skills to compensate for the daily stress during the study improve the quality and performance.

Reflection: using the acquired knowledge and skills to compensate for the daily stress and improve the quality of the professional and family life.

Transferable skills – acquired skills contribute to endurance and physical fitness necessary for study and work.

Metode poučevanja in učenja:

- predavanja v okviru vaj,
- vaje,
- skupinske in individualne konzultacije.

Learning and teaching methods:

- lectures within practical work
- practical work,
- group and individual consultations.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način:	Weight (in %)	Type
Sprotno preverjanje (sodelovanje na vajah v izbranem vadbenem programu, praktični prikaz pridobljenega znanja)	75%	Continuing (attendance at training sessions in the selected program, practical demonstration of knowledge and skills)
Končno preverjanje (ustno izpraševanje in preverjanje pridobljenih spretnosti) Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).	25%	Final (oral examination and assesment of aquired skills) Grading: 6-10 positive, negative 5 (according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:

1. Mihevc, I., Kondrič, M., I. 2002; Evaluating certain morfological characteristics and motor abilities of electrical engineering studets. - 3rd Interneticional scientific conferenc, Kinesiology new perspectives (str. 600 – 604)
2. Opatija, Croatia,
3. Križaj D., Mihevc I.; 2008 Prenosni merilni sistemi za merjenje pospeškov; Revija Šport (2008)
4. Mihevc, I., Žibert, J. (2013) Analiza intenzivnosti pri športni vadbi študentov Univerze v Ljubljani, Zbornik 26. mednarodnega posveta športnih pedagogov Slovenije [Translation: Analysis of insensitivity during UL students' sport activities, Journal of the 26th International Consultation of Physical Education Teachers of the Republic of Slovenia] , Postojna, 15. in 16. november 2013.
5. Selektor Univerzitetne nogometne reprezentance na Evropskem prvenstvu v Podgorici 2009.

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet: Tehnične veščine 2
Course title: Computer Science Skills 2

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	2, 3	zimski/ poletni
Professional study program Computer and Information Science, 1st cycle	none	2, 3	fall/spring

Vrsta predmeta / Course type

izbirni predmet / elective course

Univerzitetna koda predmeta / University course code:

63766

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Laboratory work	Druge oblike študija Field work	Samost. delo Individ. work	ECTS
15	/	45	/	/	30	3

Nosilec predmeta / Lecturer:

skrbnika študijskih programov računalništva in informatike 1. stopnje

Jeziki /

Predavanja / Lectures: slovenščina, angleščina

Languages:

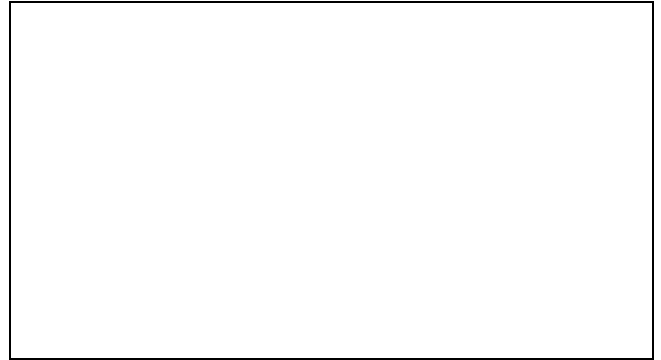
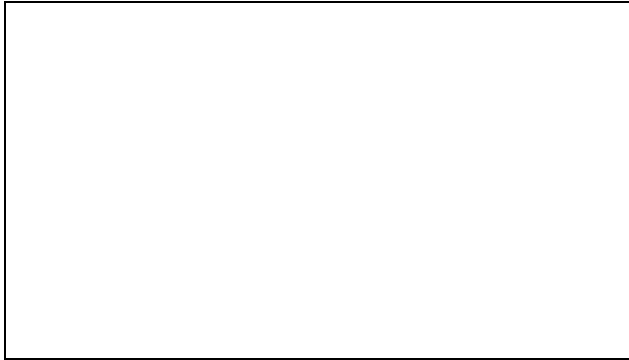
Slovene, English

Vaje / Tutorial: slovenščina, angleščina

Slovene, English

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

Prerequisites:

**Vsebina:**

Predmet je izrazito praktično naravnani in je namenjen temu, da se študente seznanijo s praktičnimi temami računalništva in informatike, ki so v študijskem programu obdelane z bolj teoretičnega stališča ali pa sploh ne, so pa pomembne za delo v praksi in za sposobnost razumevanja in izvedbe konkretnih računalniških nalog in del. Primeri takšnih tem so posamezni programski jeziki (C++, JavaScript) in okolij (Django, Android, iOS), administracija sistemov in omrežij in podobno. V računalništvu se takšne nove teme redno pojavljajo, nemogoče je, da bi bile vse takšne zanimivosti in novosti vključene v obvezne ali strokovno izbirne predmete, smiselno pa je, da ponudimo študentom možnost, da se njimi seznanijo.

Content (Syllabus outline):

The course is practically oriented and intended for introducing the students to some practical concepts and topics of computer science and informatics, which in other courses are addressed only theoretically or omitted, but are important for practical work, specific tasks, and projects. Examples of such topics are specific programming languages (C++, JavaScript) and platforms (Django, Android, iOS), system and network administration and similar. Such new topics regularly appear in computer and information science and it is reasonable to give the students an opportunity to learn about them.

Temeljna literatura in viri / Readings:

[Thomas H. Cormen](#), [Charles E. Leiserson](#): Introduction to Algorithms, 3rd edition, MIT Press, 2009.

Knuth, Donald: The Art of Computer Programming, ADDISON WESLEY (PEARSON (2011)

The pragmatic bookshelf (<http://pragprog.com/>)

Dodatna literatura se predpiše vsako leto posebej glede na vsebino in predloge izbranega predavatelja.

Additional literature is given annually based on the current topic of the course.

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

Cilj predmeta je podrobneje spoznati praktične in učinkovite pristope in temeljito spoznati delo v posameznih orodjih, jezikih in okoljih.

The object of this course is mastering and understanding efficient practical solutions and gaining a thorough understanding of specific tools, programming languages, or platforms.

Predvideni študijski rezultati:

Znanje in razumevanje:

Študenti spoznavajo praktično delo s konkretnimi orodji in okolji.

Uporaba:

Uporaba najnovejših pristopov in tehnik v izbranem okolju, jeziku ali orodju.

Refleksija:

Temeljito poznavanje najnovejših orodij in platform, seznanjanje s povsem praktičnimi problemi in rešitvami pri konkretnem programerskem in razvojnem delu na področju računalništva.

Prenosljive spretnosti - niso vezane le na en

predmet: poznavanje praktičnih pristopov, prilagodljivost pri uporabi različnih orodij in delu v različnih računalniških okoljih.

Intended learning outcomes:

Learning and understanding:

The students are acquainted with practical work using specific tools and specific platforms.

Application:

Applying state-of-the-art techniques and approaches on a chosen platform, language, or tool.

Reflection:

A thorough knowledge of a specific state-of-the-art tool or platform, a close encounter with practical problems and solutions in specific programming and engineering work in computer and information science.

Transferable skills:

Understanding »tricks of the trade«, developing a flexibility and ability to adapt to work in different contexts.

Metode poučevanja in učenja:

Predavanja, laboratorijske vaje.

Learning and teaching methods:

Lectures, lab practice.

Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

Type (examination, oral, coursework, project):

Sprotno preverjanje (domače naloge, kolokviji in projektno delo)	50%	Continuing (homework, midterm exams, project work)
Končno preverjanje (pisni in ustni izpit)	50%	Final (written and oral exam)
Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).		Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).

Reference nosilca / Lecturer's references:

izr. prof. dr. Zoran Bosnić:

- ZUPANC, Kaja, BOSNIĆ, Zoran. Automated essay evaluation with semantic analysis. Knowledge-based systems, ISSN 0950-7051. [Print ed.], Mar. 2017, vol. 120, str. 118-132.
- OCEPEK, Uroš, RUGELJ, Jože, BOSNIĆ, Zoran. Improving matrix factorization recommendations for examples in cold start. Expert systems with applications, ISSN 0957-4174. [Print ed.], Nov. 2015, vol. 42, no. 19, str. 6784-6794.
- BOSNIĆ, Zoran, DEMŠAR, Jaka, KEŠPRET, Grega, Rodrigues, Pedro Pereira, Gama, João, Kononenko, Igor. Enhancing data stream predictions with reliability estimators and explanation. Engineering applications of artificial intelligence, ISSN 0952-1976. [Print ed.], 2014, vol. 34, str. 178-192.
- BOSNIĆ, Zoran, KONONENKO, Igor. Estimation of individual prediction reliability using the local sensitivity analysis. Applied intelligence, ISSN 0924-669X. [Print ed.], Dec. 2008, vol. 29, no. 3, str. 187-203, ilustr.
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UČNI NAČRT PREDMETA / COURSE SYLLABUS**Predmet:** Uporaba IT za študijske zadeve**Course title:** Use of IT for study**Študijski program in stopnja****Študijska smer****Letnik****Semester****Study programme and level****Study field****Academic year****Semester**

Visokošolski strokovni študijski program prve stopnje Računalništvo in informatika	ni smeri	vsi letniki	zimski, poletni
Professional study program Computer and Information Science, 1st cycle	none	all years	fall, spring

Vrsta predmeta / Course type

izbirni predmet / elective course

Univerzitetna koda predmeta / University course code:

63001

Predavanja	Seminar	Vaje	Klinične vaje	Druge oblike študija	Samost. delo	ECTS
Lectures	Seminar	Tutorial	Laboratory work	Field work	Individ. work	
30	/	15	/	/	45	3

Nosilec predmeta / Lecturer:

doc. dr. Veljko Pejović

Jeziki /**Predavanja /** slovenščina / Slovene**Languages:****Lectures:****Vaje / Tutorial:** slovenščina / Slovene**Prerequisites:**

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

Vključi se lahko vsak, ki je vpisan v pripravljalni modul za tujce ali študenti drugih članic predvsem s področja družboslovja in humanistike.

Open to anyone enrolled in the preparatory module for foreigners or students from other member faculties, particularly in the fields of sociology and the humanities.

Vsebina:

Predavanja:

Predstavitve univerzitetnih informacijskih sistemov (univerzitetna digitalna identiteta, spletna učilnica, študijska informatika, urnik, spletne strani).

Predavanja:

Priprava informacijskega okolja za študij ter izbira teme za nalogo, ki se navezuje na študijsko smer posameznega študenta.

Vaje:

Priprava računalnika, povezovanje v omrežje UL (eduroam), namestitve programske opreme, seznanitev z zasebnostjo in varnostjo v omrežju.

Predavanja:

Iskanje literature (uporaba knjižničnih storitev, repozitorija UL ter knjižničnih informacijskih sistemov), uporaba baz z znanstvenimi članki ter upravljanje z znanstveno literaturo.

Vaje:

Pristopi k izdelavi pregleda obstoječe literature (strukturiranje, miselni vzorci), knjižničnih storitev (COBISS, WoS), orodja za upravljanje z viri in literaturo (Mendeley, Zotero).

Predavanja:

Content (Syllabus outline):

Lectures:

Introduction to university information systems (university digital ID, web classroom, student information system, timetable, web pages).

Lectures:

Preparation of information environment for study purposes and topic selection for the practical student task, related to the student's field of study.

Tutorial:

Preparation of computer for the study purposes, connection to university network infrastructure (eduroam), installation of software that will be used during study, familiarization with security and privacy issues.

Lectures:

Overview of existing literature (use of library services, UL repository), use of databases and management with literature.

Tutorial:

Approaches to preparation of overview of the existing literature (structure, mind mapping), library services (COBISS, WoS), tools for management with literature (Mendeley, Zotero).

Informacijsko podprto akademsko pisanje in uporaba urejevalnikov besedil ter akademska poštenost in etika – citiranje, plagiarizem in intelektualna lastnina.

Vaje:

Pristopi in dobre prakse k akademskemu strukturiranemu pisanju, urejevalniki besedil (Word, Latex).

Predavanja:

Uporaba informacijskih orodij za grafično oblikovanje, vizualizacijo in analizo podatkov ter orodji za izdelavo predstavitev

Vaje:

Orodja za grafično oblikovanje (draw.io, gimp, inkscape, MS Visio), orodja za analizo podatkov (MS Excel, Calc, Octave), orodja za izdelavo prezentacij (MS PowerPoint, Prezi), izdelava enostavne spletne strani (HTML+CSS).

Predavanja:

Kultura elektronskega komuniciranja in kritično razmišljanje, uporaba informacijskih orodij za sodelovanje in produktivnost.

Vaje:

Orodja za sodelovanje in produktivnost (Google Drive, Dropbox, Google Docs, Office365+OneDrive, Overleaf, Sharelatex).

Predstavitev končne naloge

Lectures:

IT-supported academic writing, the use of text editors, academic ethics – citing, plagiarism and intellectual property.

Tutorial:

Approaches and best practices to academic and structured writing, insight into text editors (Word, Latex).

Lectures:

Use of the tools for graphical design and editing, visualization and analysis of the results, preparation of presentations.

Tutorial:

Tools for graphical design (draw.io, gimp, inkscape, MS Visio), tools for data analysis and visualization (MS Excel, Calc, Octave), tools for preparation of presentations (MS PowerPoint, Prezi), preparation of simple web page (HTML+CSS).

Lectures:

Culture of electronic communication, critical thinking, collaborative and productivity tools.

Tutorial:

The use of collaborative and productivity tools (Google Drive, Dropbox, Google Docs, Office365+OneDrive, Overleaf, Sharelatex).

Presentation of practical student task

Temeljna literatura in viri / Readings:

1. Walter Pauk: How to Study in College, 11th ed.: Cengage Learning; 11 edition, 2013.
2. Mary W. George: The Elements of Library Research: What Every Student Needs to Know, Princeton University Press, 2008.
3. The Open University: Using a computer for study. The Open University, March 2016.
4. Cal Newport: How to Become a Straight-A Student: The Unconventional Strategies Real College Students Use to Score High While Studying Less. Three Rivers Press, 2006.

Cilji in kompetence:

Glavni cilj predmeta je usposobiti študente za informacijsko podprt študij na UL in obvladovanje ustreznih informacijskih orodij. Predavanja in praktični del predmeta bodo študenta na strukturiran način usposobile za uporabo IT za namen študija na UL. Vsak študent si bo izbral eno temo iz svojega področja študija, ki se mu zdi najbolj zanimiva, in zanjo v okviru vaj izdelal nalogo, v obliki poročila, ki bo predstavljalo prijazno in enostavno obliko pregleda stanja s kritičnim mnenjem študenta. To nalogo bo študent izdeloval sproti po tednih – na ta način ga bodo teme tedenskih predavanj in vaj vodile proti končnemu cilju.

Objectives and competences:

The main objective of the course is to train students for IT-supported study and how to use the relevant IT tools and software. The lectures and practical part of the course will in a structured way train a student for the use of IT for study on UL. Each student will first pick a theme of his interest from his field of study. During the practical part of the course, each student will perform a task in terms of report that will be represented in a nice and simple form of the literature overview accompanied with student's critical opinion on the selected topic. Weekly assignments that are directly related to particular topics during the lectures will guide a student towards the main objective.

Predvideni študijski rezultati:

Priprava informacijskega okolja, primerne za študijsko delo in *uporaba* univerzitetnih študijskih informacijskih sistemov.

Obvladovanje informacijskih orodij za pisanje akademskih tekstov, orodij za iskanje in upravljanje bibliografskih enot, orodij za osnovno grafično oblikovanje, vizualizacijo, pripravo prezentacij ter orodij za sodelovanje in produktivnost.

Znanje in razumevanje vizualnega in logičnega urejevanja tekstov, obvladovanje akademskega pisanja in kulture elektronskega komuniciranja.

Seznaitvev študentov z akademsko etiko, vključujoč citiranje, plagiarizem in intelektualno lastnino.

Intended learning outcomes:

Students will be able to *prepare* an information environment suitable for their study and to *use* university information systems.

Mastering of IT tools for academic writing, IT tools for literature searching and managing, IT tools for basic graphical design, vizualization, preparation of presentations, as well as collaborative and productivity tools.

Students will get *knowledge and comprehension* in terms of visual and logic text preparation, mastering of academic writing and the culture of electronic communication.

Students will be *acquainted* with academic etics, including citing, plagiarism and intellectual property.

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

Predavanja, laboratorijske vaje, tutorski način dela.	Lectures, laboratory work, tutorial approach to teaching.
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Delež (v %) /

Načini ocenjevanja:

Weight (in %)

Assessment:

<p>Sprotno delo: delo na vajah in kratke seminarske naloge</p> <p>Ocene: 6-10 pozitivno, 5 negativno (v skladu s Statutom UL).</p>	100 %	<p>On-going work: work at laboratory sessions and completed short seminar papers.</p> <p>Grading: 6-10 pass, 5 fail (according to the rules of University of Ljubljana).</p>
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Reference nosilca / Lecturer's references:**Pet najpomembnejših del:**

V. Pejović and E. M. Belding. WhiteRate: A Context-aware Approach to Wireless Transmission Adaptation. IEEE Transactions on Mobile Computing, 13, no. 4 (2014): 921-934.

N. Lathia, V. Pejović, K. Rachuri, C. Mascolo, M. Musolesi and P. J. Rentfrow. Smartphones for Large-Scale Behavior Change Intervention IEEE Pervasive Computing, Vol 12 (3), (2013)

V. Pejović and M. Musolesi. Anticipatory Mobile Computing: A Survey of the State of the Art and Research Challenges ACM Computing Surveys (CSUR) 47.3 (2015)

V. Pejović, D. L. Johnson, M. Zheleva, E. M. Belding, L. Parks and G. van Stam. The Bandwidth Divide: Obstacles to Efficient Broadband Adoption in Rural Sub-Saharan Africa. International Journal of Communication, Vol 6 (2012).

V. Pejović and M. Musolesi. InterruptMe: Designing Intelligent Prompting Mechanisms for Pervasive Applications UbiComp'14, Seattle, WA, USA, September 2014.

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