

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Operacijske raziskave
Course title:	Operational Research

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Informatika v sodobni družbi, visokošolski strokovni in univerzitetni študijski program prve stopnje	-	Drugi ali tretji	Četrty ali šesti
Informatics in Contemporary Society, first cycle Professional Study Programme and Academic Study programme	-	Second or third	Fourth or sixth

Vrsta predmeta / Course type

Izbirni / Elective

Univerzitetna koda predmeta / University course code:

1-ISD-VS,UN-IP-OR-2019-05-13

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

Nosilec predmeta / Lecturer:

Jeziki /

Languages:

Predavanja /

Lectures:

Slovenski, angleški / Slovene, English

Vaje / Tutorial:

Slovenski, angleški / Slovene, English

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

- Pogoji za vključitev v delo je vpis v 2. ali 3. letnik študija.
- Pogoji za pristop k izpitu so opravljene vse obveznosti na vajah.

Prerequisites:

- Enrolment into the second or into the third year of the study.
- Student has to pass all requirements given at the exercises before examination.

Vsebina:

- *Uvod v operacijske raziskave (OR):* definiranje OR kot discipline uporabljenih analitskih metod za izboljšanje odločanja; definicija interdisciplinarnosti; pregled modeliranja v OR.
- *Linearno programiranje:* motivacijski primer; matematična predstavitev problema; predpostavke linearnega programiranja; grafični

Content (Syllabus outline):

- *Introduction to operational research (OR):* a discipline of applied analytical methods to improve decision making; definition of the interdisciplinary nature of OR; overview of the OR modelling approach.
- *Linear programming:* prototype example; mathematical problem representation; assumptions of

<p>prikaz in reševanje problemov; dvojno zastopanje problema; dopolnilne spremenljivke; simpleks metoda.</p> <ul style="list-style-type: none"> • <i>Mrežno planiranje in vodenje projekta:</i> motivacijski primeri; metoda kritične poti (CPM); metoda PERT; načrtovanje projekta s PERT/CPM; aktivnosti z negotovim trajanjem dejavnosti; vrednotenje PERT/CPM modela. • <i>Dinamično programiranje:</i> motivacijski primer; značilnosti dinamičnega programiranja; deterministično in verjetnostno dinamično programiranje. • <i>Analiza odločanja:</i> motivacijski primer; odločanje z in brez poskusov; odločitvena drevesa; teorija koristnosti. • <i>Teorija iger:</i> motivacijski primer; formulacija igre 2 igralca, z ničelno vsoto igre; reševanje z mešano strategijo; reševanje z linearnim programiranjem, itd. • <i>Teorija zalog:</i> motivacijski primer, osnovna struktura v vrsti modelov (QM); primeri real strežnih sistemov. 	<p>linear programming; graphical representation and solution of the problems; dual representation of the problem; slack variables; simplex method.</p> <ul style="list-style-type: none"> • <i>Network planning and project management:</i> prototype examples; critical path method (CPM); The Program Evaluation and Review Technique (PERT); scheduling a project with PERT/CPM; dealing with uncertain activity durations; an evaluation of PERT/CPM. • <i>Dynamic Programming:</i> prototype example, characteristics of dynamic programming; deterministic and probabilistic dynamic programming. • <i>Decision analysis:</i> prototype example; decision-making with and without experimentation; decision trees; utility theory. • <i>Game theory:</i> prototype example; formulation of two-persons, zero-sum game; solving with mixed strategy; solving by linear programming, etc. • <i>Queuing theory:</i> prototype example, basic structure of queuing models (QM); examples of real queuing systems.
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Temeljni literatura in viri / Readings:

<ul style="list-style-type: none"> • HILLIER, FREDERICK S. in LIEBERMAN GERALD J. (2001) <i>Introduction to Operations Research</i>. New York: McGraw-Hill. • WINSTON, WAYNE L. (1998) <i>Operations research: Applications and algorithms</i>. Rossendale: Revival Books Ltd. • BRONSON, RICHARD in NAADIMUTHU, GOVINDASAMI (1996) (Schaum's Outline of Theory and Problems of) <i>Operations Research</i>. Second Edition. New York: McGraw-Hill. • VADNAL, ALOJZIJ (letnica) <i>Rešeni problemi linearnega programiranja</i>. Zbirka SIGMA. Ljubljana: DZS. • ROBERTS, FRED S. (1976) <i>Discrete Mathematical Models</i>. New Jersey: Prentice-Hall, Englewood Cliffs. • WATERS, DONALD (1997) <i>Quantitative Methods for Business</i>. Essex: Addison Wesley.

Cilji in kompetence:

Učna enota prispeva k razvoju naslednjih splošnih in predmetno-specifičnih kompetenc:

- obvladanje raziskovalnih metod, postopkov in procesov

Objectives and competences:

The instructional unit contributes to the development of the following general and subject-specific competences:

- competence in research methods, procedures and processes

- poznavanje in razumevanje družbenih procesov ter sposobnost za njihovo analizo, sintezo in predvidevanje rešitev in njihovih posledic
- organizacijske in vodstvene spretnosti za organiziranje aktivnega in samostojnega dela
- sposobnost zapisati problem v obliki algoritma in pretvorba algoritma v računalniški program z uporabo sodobnih programskih orodij
- razumevanje in uporaba računalniških sistemov in arhitektur

- familiarity with and understanding of social processes and competence for their analysis, synthesis and prediction of solutions as well as consequences thereof
- managerial and leadership skills for organizing active and autonomous work
- ability to write down a problem in the form of an algorithm and the conversion of the algorithm into a computer programme with the use of modern software tools
- understanding and use of computer systems and architectures

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent/študentka:

- spozna in razume zamisli, pomen, zmožnosti in uporabnost operacijskih raziskav
- razume in uporablja osnovne funkcije standardne programske opreme za reševanje OR problemov ter praktično aplicirati izbran problem

Intended learning outcomes:

Knowledge and understanding:

The student:

- understands ideas, meanings, capabilities and usabilities of operational research
- understands and uses the basics of standard softwares for solving OR problems and practical application of the selected problem

Metode poučevanja in učenja:

- *Predavanja* z aktivno udeležbo študentov (razlaga, diskusija, vprašanja, primeri, reševanje problemov).
- *Vaje* v računalniški učilnici: študentje bodo spoznali, preizkusili in reševali primere s katerimi bodo utrjevali snov s predavanj, ob uporabi standardne komercialne ali proste programske opreme.
- *Domače naloge* in/ali projektna naloga: z njimi bodo študentje s samostojnim delom utrdili znanje, pridobljeno na predavanjih in vajah.

Learning and teaching methods:

- *Lectures* with the active participation of students (presentation, discussion, questions, examples, problem solving).
- *Exercises* will be held in computer laboratory: Students will learn, test, and deal with cases with which will consolidate the material from lectures, using standard commercial or free software.
- *Homeworks* and/or project work: students will consolidate the knowledge gained in class and through the practical work.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
<p>Način (pisni izpit, ustno izpraševanje, naloge, projekt):</p> <ul style="list-style-type: none"> • pisni izpit • domače naloge <p>Študent lahko opravi izpit, če domače naloge opravi dovolj dobro (več kot 50 % možnih točk). Pri tem se za končno oceno upošteva tehtano povprečje točk domačih nalog in izpita.</p>	<p>80</p> <p>20</p>	<p>Type (examination, oral, coursework, project):</p> <ul style="list-style-type: none"> • written exam • homeworks <p>Student can pass the exam by doing homeworks good enough (receives more than 50 % of possible points). Final grade is obtained based on a weighted average of the exam and homeworks.</p>