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	Četrti 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-2016-10-01

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
30	-	30	-	15	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:	**Prerequisits:**
• Pogoj za vključitev v delo je vpis v 2. ali 3. letnik študija. • Pogoj za pristop k izpitu so opravljene vse obveznosti na vajah.	• 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:	**Content (Syllabus outline):**
• *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	• *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

prikaz in reševanje problemov; dvojno zastopanje problema; dopolnilne spremenljivke; simpleks metoda.

- *Mrežno planiranje in vodenje projekta:*
motivacijski primeri; metoda kritične poti (CPM); metoda PERT; načrtovanje projekta s PERT/CPM; aktivnosti z negotovim trajanjem dejavnosti; vrednotenje PERT/CPM modela.
- *Dinamično programiranje:*
motivacijski primer; značilnosti dinamičnega programiranja; deterministično in verjetnostno dinamično programiranje.
- *Analiza odločanja:*
motivacijski primer; odločanje z in brez poskusov; odločitvena drevesa; teorija koristnosti.
- *Teorija iger:*
motivacijski primer; formulacija igre 2 igralca, z ničelno vsoto igre; reševanje z mešano strategijo; reševanje z linearnim programiranjem, itd.
- *Teorija zalog:*
motivacijski primer, osnovna struktura v vrsti modelov (QM); primeri real strežnih sistemov.

linear programming; graphical representation and solution of the problems; dual representation of the problem; slack variables; simplex method.
- *Network planning and project management:*
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.
- *Dynamic Programming:*
prototype example, characteristics of dynamic programming; deterministic and probabilistic dynamic programming.
- *Decision analysis:*
prototype example; decision-making with and without experimentation; decision trees; utility theory.
- *Game theory:*
prototype example; formulation of two-persons, zero-sum game; solving with mixed strategy; soling by linear programming, etc.
- *Queuing theory:*
prototype example, basic structure of queuing models (QM); examples of real queuing systems.

Temeljni literatura in viri / Readings:

- HILLIER, FREDERICK S. in LIEBERMAN GERALD J. (2001) *Introduction to Operations Research*. New York: McGraw-Hill.
- WINSTON, WAYNE L. (1998) *Operations research: Applications and algoritms*. Rossendale: Revival Books Ltd.
- BRONSON, RICHARD in NAADIMUTHU, GOVINDASAMI (1996) (Schaum's Outline of Theory and Problems of) *Operations Research*. Second Edition. New York: McGraw-Hill.
- VADNAL, ALOJZIJ (letnica*) Rešeni problemi linearnega programiranja*. Zbirka SIGMA.Ljubljana: DZS.
- ROBERTS, FRED S.(1976) *Discrete Mathematical Models*. New Jersey: Prentice-Hall, Englewood Cliffs.
- WATERS, DONALD (1997) Quantitative Methods for Business. Essex: Addison Wesley.

Cilji in kompetence:

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

Splošne kompetence:
- pridobljeno znanje o temeljnih metodah v OR

Objectives and competences:

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

General competences:
- acquired knowledge on basic methods in OR

- sposobnost zaznati problem or in zagotoviti postopek za njegovo rešitev

Predmetno-specifične kompetence:
- poznavanje konceptov OR, razvoj modelov specifičnih problemov in zmožnost uporabe matematičnega znanja v praksi
- pridobivanje znanja o osnovnih orodjih za reševanje OR problemov
- razvoj spretnosti za prepoznavanje in analizo problemov z OR v resničnem življenju

- ability to detect an OR problem and provide a method for its solution

Subject-specific competences:
- getting concepts of OR, develop problem specific models, and apply the mathematical knowledge in practice
- getting knowledge in basic tools for solving OR problems
- developing skills for detecting and analysis of real life problems with OR methods

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:
Način (pisni izpit, ustno izpraševanje, naloge, projekt): • pisni izpit • domače naloge 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.	 80 20	Type (examination, oral, coursework, project): • written exam • homeworks 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.