

| UČNI NAČRT PREDMETA / COURSE SYLLABUS | |
|---------------------------------------|-------------------------------------|
| Predmet: | OPTIMIZACIJA LOGISTIČNIH PROCESOV |
| Course title: | OPTIMIZATION OF LOGISTICS PROCESSES |

| Študijski program in stopnja Study programme and level | Študijska smer Study field | Letnik Academic year | Semester Semester |
|---|-------------------------------|-------------------------|----------------------|
| LOGISTIKA SISTEMOV 2.stopnja | | 1. | 1. |
| SYSTEM LOGISTICS 2.degree | | 1. | 1. |

Vrsta predmeta / Course type: OBVEZNI

Univerzitetna koda predmeta / University course code: MAG 1

| Predavanja Lectures | Seminar Seminar | Vaje Tutorial | Klinične vaje Laboratory work | Druge oblike študija Field work | Samost. delo Individ. work | ECTS |
|------------------------|--------------------|------------------|----------------------------------|------------------------------------|-------------------------------|------|
| 24 e-P 21 a-P | | 10 e-V 30 a-V | | | 155 | 8 |

Nosilec predmeta / Lecturer: DAMIR VRANČIČ, DEJAN DRAGAN

Jeziki / Predavanja / Lectures: SLOVENSKI / SLOVENE
 Languages: Vaje / Tutorial: SLOVENSKI / SLOVENE

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

Ni pogojev.

Prerequisites:

None

Vsebina:

Nelinearno programiranje in nelinearna optimizacija logističnih procesov: Modeliranje nelinearnih problemov v logistiki, Enodimenzionalna numerična nelinearna optimizacija, Večdimenzionalna numerična nelinearna optimizacija (osnovne in sofisticirane metode), Geometrijsko programiranje.

 Predstavitev optimizacije pri reševanju praktičnih lokacijskih problemov v logistiki: Optimizacijski in heuristični algoritmi pri lokacijskih problemih, Uporaba Monte Carlo simulacije pri optimizaciji prevoza otrok v šolo in pri optimizaciji dostavnih mest.

 Optimalno upravljanje zalog pri konstantnem determinističnem povpraševanju: Določitev optimalne naročilne količine, optimalnega časa naročila in optimalnega maksimalnega dovoljenega primanjkljaja (hipno ali postopno polnjenje,

Content (Syllabus outline):

Non-linear programming and nonlinear optimization of logistic processes: Modeling of nonlinear problems in logistics, One-dimensional nonlinear numerical optimization, Multidimensional nonlinear numerical optimization (basic and sophisticated methods), Geometric programming.

 Presentation of optimization for the case of solving of practical location problems in logistics: Optimization and heuristic algorithms for location problems, Use of Monte Carlo simulation for the optimization of bus stops and school bus routing problem, Use of Monte Carlo simulation for the optimization of the freight transport delivery spots.

 Optimal inventory management in the case of constant deterministic demand: Determination of the optimal order quantity, optimal time of order, and the optimal maximum allowed shortage (instant or gradual

primanjkljaj je ali pa ni dovoljen).

Uvod v regresijo in napovedovanje v operacijskih raziskavah:

Predstavitev modeliranja z enostavno linearno regresijo in regresijsko premico, Predstavitev modeliranja z multiplo linearno regresijo, Primeri iz operacijskih raziskav.

Uvod v napovedovanje časovno odvisnega povpraševanja: Določanje komponent časovnih vrst in dekompozicija, Model regresijske premice, Brownova metoda pri konstantnem trendu, Holtova metoda pri dodatnem linearnem trendu, Wintersova metoda pri dodatnem sezonskem trendu.

Modeliranje in optimalno upravljanje prometnih tokov:

Matematično modeliranje stacionarnega in dinamičnega prometnega toka. Whitham-Payne-ov model prometnega toka. Nelinearne teorije sledenja. Celično modeliranje prometnega toka. Prometni zastoji. Raziskovanje zakonitosti matematičnega modeliranja prometnih tokov. Modeliranje dinamike prometnih tokov. Makroskopski modeli. Kinetični modeli. Mikroskopski modeli.

Programska orodja: Scilab, Matlab in kloni.

replenishment, shortage allowed or not allowed).

Introduction to the regression and forecasting in operations research:

Introduction to simple linear regression modeling with regression line, Introduction to multiple linear regression modeling, Examples in operations research.

Introduction to forecasting of the time-dependent demand: Determination of the components of time series and decomposition, Regression line model, Brown's method at constant trend, Holt method with an additional linear trend, Winters method with an additional seasonal trend.

Modeling and optimal control of traffic flows: Mathematical modeling of stationary and dynamic traffic flow. Payne-Whitham's model of traffic flow. Non-linear tracking theory. Cell modeling of traffic flow. Traffic congestions. Research of mathematical modeling of traffic flows. Modeling the dynamics of traffic flows. Macroscopic models. Kinetic models. Microscopic models.

Software tools: Scilab, Matlab and clones.

Temeljna literatura in viri / Readings:

DRAGAN, Dejan: Upravljanje logističnih sistemov : visokošolski učbenik. Celje: Fakulteta za logistiko, 2009.
DRAGAN, Dejan: Statistika, analiza podatkov in statistični modeli, neobjavljen učbenik v pripravi, 2014.
DRAGAN, Dejan: Optimizacija logističnih procesov: visokošolski učbenik. Celje: Fakulteta za logistiko, 2010.
Rardin, R.: Optimization in Operations Research, Prentice Hall, 1st edition, 1997, ISBN: 978-0023984150.
Chong, E. K. P.: An introduction to optimization, Wiley-Interscience, 2 Sub edition, 2001, ISBN: 978-0471391265.
Rao, Engineering optimization: theory and practice, Wiley-Interscience, 3 Sub edition, 1996, ISBN: 978-0471550341.
Vanderplaats, G. N.: Numerical optimization techniques for engineering design, Vanderplaats Research and Development, Inc, 3rd ed., 4th printing edition, 2001, ISBN: 978-0944956014.
Fletcher, R.: Practical Methods of Optimization, John Wiley & Sons, 2 Sub edition, 2000, ISBN: 0-471-49463-1.
Kutner, M.: Applied Linear Regression Models, McGraw-Hill, 4th ed., 2004.
Winston W.L.: Operations Research: Applications and Algorithms, Cengage Learning, 4th ed., 2003.
Waters D., inventory Control and Management, Wiley, 2nd ed., 2003.
Haberman R.: Mathematical Models: Mechanical Vibrations, Population Dynamics, and Traffic Flow, Society for Industrial and Applied Mathematics, 1998.
Treiber M.: Traffic Flow Dynamics: Data, Models and Simulation, Springer, 2012.
Bowerman B.L.: Forecasting, Time Series, and Regression, Cengage Learning, 4th edition, 2004.

Cilji in kompetence:

Objectives and competences:

Cilj tega predmeta je:

- nadgraditi razumevanje postopkov in orodij za optimizacijo logističnih procesov,
- se naučiti uporabe teh orodij kot podlage za optimiranje logističnih procesov,
- spoznati raziskovalno področje optimizacije logističnih procesov in ga prepoznati kot morebitno polje bodočega znanstvenega dela,
- pridobiti poglobljeno razumevanje iz optimizacije logističnih procesov ter uporabe optimizacijskih metod,
- se usposobiti za učinkovito reševanje zahtevnejših problemov na področju optimizacije logističnih procesov,
- se usposobiti za samostojno znanstveno raziskovalno delo na tem področju,
- se usposobiti za predstavitev svojega raziskovalnega dela (članki, referati).
- spoznati uporabne vsebine in se naučiti sistemskega razmišljanja, kako pristopiti k reševanju realnih problemov.
- pridobiti razumevanje teoretičnih ozadij, nujno potrebnih za interpretacijo dobljenih rezultatov računalniških orodij in ocenitev kakovosti razvitih matematičnih modelov.

The objective of the course is to:

- enhance the understanding of procedures and tools for the optimization of logistics processes,
- be familiarized with software support in order to learn to use these tools as a basis for optimization of logistics processes.
- introduce the research field of optimization of logistics processes, and recognise the possibility of its adoption for research work in the future,
- gain the ability of deeper understanding of optimization of logistics processes and the use of optimization methods,
- qualify for efficient solving of more complicated problems in the field of optimization of logistics processes,
- qualify for independent research and scientific work in this field,
- qualify for presentation of scientific work by publishing it (papers).
- to get familiar with useful contents and to gain the possibility of systematical thinking about solving of real problems,
- to gain the understanding of theoretical background, necessary for the interpretation of achieved results given by computer software and to verify the quality of developed mathematical models.

Predvideni študijski rezultati:

- Študent je ob koncu študija sposoben obvladati raziskovalne metode, postopke in procese na področju optimizacije logističnih sistemov.
- Sposobnost za samostojno znanstveno raziskovalno delo na področju optimizacije logističnih procesov. Sposobnost učinkovitega reševanja zahtevnejših problemov na tem področju. Razumevanje uporabe raziskovalnih metod z zmožnostjo poglobljene analize problemov in sistemskega razmišljanja na tem področju. Zmožnost ustvarjalnega sodelovanja pri reševanju težjih problemov v logističnih okoljih.

Intended learning outcomes:

- Graduated student is able to deal with research methods, procedures and processes in the field of optimization of logistics processes.
- The ability of independent scientific and research work in the field of optimization of logistics processes. The ability of efficient solving of more complicated problems in this field. Understanding the use of research methods with the ability of in-depth analysis and system reflection of the identified problems. The ability of creative collaboration in order to deal with solving of more difficult problems in logistics environments.

Metode poučevanja in učenja:

- Predavanja: pri predavanjih študent spozna teoretične vsebine predmeta. Del predavanj se izvaja na klasični način v predavalnici, del pa v obliki e-predavanj (e-predavanja se lahko izvajajo na videokonferenčni način ali s pomočjo posebej v ta namen didaktično pripravljenih e-gradiv v virtualnem elektronskem učnem okolju).
- Vaje: pri vajah študent utrdi teoretično znanje in spozna aplikativne možnosti. Del vaj se izvaja na klasični način v predavalnici, del pa v obliki e-predavanj (e-vaje se lahko izvajajo na

Learning and teaching methods:

- Lectures: Students understand the theoretical frameworks of the course. Part of the lecture course is in a classroom while the rest is in the form of e-learning (e-lectures may be given via video-conferencing or with the help of specially designed e-material in a virtual electronic learning environment)
- Seminars: Students enhance their theoretical knowledge and are able to apply it. Part of the seminar is in a classroom while the rest is in the form of e-learning (e-seminars may be given via video-

videokonferenčni način ali s pomočjo posebej v ta namen didaktično pripravljenih e-gradiv v virtualnem elektronskem učnem okolju).

conferencing or with the help of specially designed e-material in a virtual electronic learning environment)

| Načini ocenjevanja: | Delež (v %) / Weight (in %) | Assessment: |
|---|--------------------------------|---|
| <ul style="list-style-type: none">• Opravljen seminar• Pisni izpit• Ustni izpit | <p>30</p> <p>40</p> <p>30</p> | <ul style="list-style-type: none">• Coursework• Written examination• Oral examination |

Reference nosilca / Lecturer's references:

Opomba:

Navedene sestavine so obvezna sestavina učnega načrta predmeta kot ga določajo Merila za akreditacijo visokošolskih zavodov in študijskih programov v 7. členu (Ur. l. RS, št. 101/2004).