SYLLABUS

1. GENERAL

College	College of Applied Economics and Social Sciences
Department	Regional and Economic Development
Level of Studies	Undergraduate
Couse Code	POA 4844 **ΕΞΑΜΗΝΟ ΣΠΟΥΔΩΝ** 8TH
Course Title	Εισαγωγή στην Επιχειρησιακή Έρευνα
Faculty Name	GEORGE EKONOMOU
Office Hours	Monday – Thursday 13.00 – 14.00
email	oikonomoug@aua.gr

INDEPENDENT TEACHING ACTIVITIES where credit is awarded for discrete parts of the course e.g. lectures, laboratory exercises, etc. If credit is awarded for the whole course, indicate the weekly teaching hours and the total number of credits	WEEKLY CONTACT HOURS	ECTS
Sessions	5	5

COURSE TYPE Background, General Knowledge, Scientific Area, Skills Development	Generic Knowledge and Scientific Domain
Prerequisites	-
Language of instruction and examinations	Greek
Course Offered to Erasmus Students	NO
Course Webpage	https://oeclass.aua.gr/eclass/

2. COURSE LEARNING OUTCOMES

Learning Outcomes
The learning outcomes of the course describe the specific knowledge, skills and competences of an appropriate level that students will acquire after successful completion of the course.

- *Knowledge*
  - Define and report the basic concepts of Operational Research
  - Perceive terminology and variables used in Operational Research
  - Understand the meaning and importance of research in operational environments related to the management and coordination of enterprises and organizations

- *Abilities*
  - Analyse problems of economic nature and structure models to describe them
  - Decompose, interpret, and re-structure problems related to operational research and economics, evaluate and select the most beneficial solutions
  - Search for new solutions under different condition frameworks, such as sensitivity analysis
  - Model problems with the use of programs and the necessary technologies and cultivate collective ways of thinking

- *Skills*
  - Practice work in a multidisciplinary environment and advance effective, applicable, and sustainable solutions for the development of a healthy and human-centric entrepreneurship

Generic Skills
Taking into account the general competences that the graduate should have acquired (as listed in the Diploma Supplement and listed below), which one(s) does the course aim at?

Search, analysis and synthesis of data and information, including the use of the necessary technologies	*Project planning and management*
Adaptation to new situations	*Respect for diversity and multiculturalism*
Decision-making	*Respect for the natural environment*
Autonomous work	*Demonstrating social, professional and ethical responsibility and gender sensitivity*
Group work	*Exercise of criticism and self-criticism*
Working in an international environment	*Promotion of free, creative and deductive thinking*
Working in an interdisciplinary environment	
Generating new research ideas	

Adjustments to new situations
Work in multidisciplinary environments
Planning and management of projects
Production of free, creative and inductive thinking

3. COURSE CONTENT

Introduction to Operational Research. Basic concepts of linear programming, problem modeling, general prototype, interpretation, mathematical formulation, problem-solving, and graphical representation for linear programming problem-solving. SIMPLEX method, typical form, algorithm. M method, and two phases method. Binary method, attributes of binary problems, Binary SIMPLEX method, Sensitivity Analysis, The transportation problem. Problems of integer and mixed programming. Dynamic Programming. Applications in Economic and Regional Science.

4. TEACHING AND LEARNING METHODS – ASSESSMENT

METHOD OF DELIVERY Face-to-face, Distance learning, etc.	Lectures and meetings with students	
USE OF TECHNOLOGY, INFORMATION AND COMMUNICATION *Use of ICT in teaching, laboratory training, communication with students*	*Use of interactive tables in teaching. The communication with the students will take place in the face-to-face level, also with emails and the use of direct electronic communication (e.g., skype)*	
ORGANISATION OF TEACHING *The way and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Study & Analysis of Literature, Tutorials, Practical (Placement), Clinical Exercise, Artistic Workshop, Interactive teaching, Educational visits, Study visits, Project work, Writing of work / assignments, Artistic creation, etc.* *The student's study hours for each learning activity as well as the hours of unguided study are indicated so that the total workload at semester level corresponds to the ECTS standards.*	**Activity**	**Semester Work Load**
	Course delivery	65 hours
	Study of taught material	27 hours
	Exercises and practice in the field of natural resource economics	33 hours
	Course Total	125
STUDENT ASSESSMENT *Description of the evaluation process* *Language of Assessment, Assessment Methods, Formative or Inferential, Multiple Choice Test, Short Answer Questions, Test Development Questions, Problem Solving, Written Work, Report, Oral Examination, Oral Examination, Public Presentation, Laboratory Work, Clinical Examination of a Patient, Artistic Interpretation, Other* *Explicitly identified assessment criteria are stated and if and where they are accessible to students.*	Written Final Exams and tentative midterm examinations during the course	

5. RECOMMENDED BIBLIOGRAPHY

Main Textbooks

GREEK BIBLIOGRAPHY (Titles in the Greek Language)
1. Δ. Φακίνος, Α. Οικονόμου, (2003) «Εισαγωγή στην Επιχειρησιακή Έρευνα», Εκδόσεις Συμμετρία.
2. Hillier F.S., Lieberman G.J., Διαμαντίδης Α. (Επιστ. Επιμέλεια) (2022) Εισαγωγή στην Επιχειρησιακή Έρευνα, 11η Έκδοση, Εκδόσεις Α. Τζιόλα
3. Κολέτσος Ι., Στογιάννης Δ., (2021) Εισαγωγή στην Επιχειρησιακή έρευνα, Εκδόσεις Καλαμαρά
4. Παντελής, Υ. (2015) Επιχειρησιακή Έρευνα, Προπομπός

FOREIGN BIBLIOGRAPHY
1. Morse, P. M., Kimball, G. E., & Gass, S. I. (2003). Methods of operations research. Courier Corporation.

2. Jensen, P. A., & Bard, J. F. (2002). Operations research models and methods. John Wiley & Sons.
3. Ray, S. C. (2004). Data envelopment analysis: theory and techniques for economics and operations research. Cambridge university press.
4. F. S. Hillier, G. J. Lieberman, (2005) "Introduction to Operations Research", McGraw-Hill.
5. Maros, I. (2002). Computational techniques of the simplex method (Vol. 61). Springer Science & Business Media.
6. Paris, Q. (2016). An economic interpretation of linear programming. Springer.
7. Kaiser, H. M., & Messer, K. D. (2011). Mathematical programming for agricultural, environmental and resource economics. John Wiley and Sons, Inc.
8. Padberg, M. (2013). Linear optimization and extensions (Vol. 12). Springer Science & Business Media.

RECOMMENDED ARTICLES
1. Protasov, V. Y. (2016). Spectral simplex method. Mathematical Programming, 156(1-2), 485-511.
2. Dütting, P., Henzinger, M., & Weber, I. (2013). Sponsored search, market equilibria, and the Hungarian Method. Information Processing Letters, 113(3), 67-73.
3. Maity, G., & Kumar Roy, S. (2016). Solving a multi-objective transportation problem with nonlinear cost and multi-choice demand. International Journal of Management Science and Engineering Management, 11(1), 62-70.
4. Borgatti, S. P., Mehra, A., Brass, D. J., & Labianca, G. (2009). Network analysis in the social sciences. Science, 323(5916), 892-895.
5. Stahlbock, R., & Voß, S. (2008). Operations research at container terminals: a literature update. OR spectrum, 30(1), 1-52.
6. Shy, O. (2011). A short survey of network economics. Review of Industrial Organization, 38(2), 119-149.
7. Higgins, A. J., Miller, C. J., Archer, A. A., Ton, T., Fletcher, C. S., & McAllister, R. R. J. (2010). Challenges of operations research practice in agricultural value chains. Journal of the Operational Research Society, 61(6), 964-973.
8. Facchinei, F., & Kanzow, C. (2010). Generalized Nash equilibrium problems. Annals of Operations Research, 175(1), 177-211.
9. Tong, D., & Murray, A. T. (2012). Spatial optimization in geography. Annals of the Association of American Geographers, 102(6), 1290-1309.
10. Anas, A. (2013). Modelling in urban and regional economics. Taylor & Francis.
11. Omu, A., Choudhary, R., & Boies, A. (2013). Distributed energy resource system optimisation using mixed integer linear programming. Energy Policy, 61, 249-266.
12. Firth, S. K., Lomas, K. J., & Wright, A. J. (2010). Targeting household energy-efficiency measures using sensitivity analysis. Building Research & Information, 38(1), 25-41.
13. Rafiee, S., Avval, S. H. M., & Mohammadi, A. (2010). Modeling and sensitivity analysis of energy inputs for apple production in Iran. Energy, 35(8), 3301-3306.
14. Chen, Y., Yu, J., & Khan, S. (2010). Spatial sensitivity analysis of multi-criteria weights in GIS-based land suitability evaluation. Environmental modelling & software, 25(12), 1582-1591.
15. He, P., Ng, T. S., & Su, B. (2017). Energy-economic recovery resilience with Input-Output linear programming models. Energy Economics, 68, 177-191.
16. Demirel, E., Demirel, N., & Gökçen, H. (2016). A mixed integer linear programming model to optimize reverse logistics activities of end-of-life vehicles in Turkey. Journal of Cleaner Production, 112, 2101-2113.
17. Hajiahmadi, M., Haddad, J., De Schutter, B., & Geroliminis, N. (2014). Optimal hybrid perimeter and switching plans control for urban traffic networks. IEEE Transactions on Control Systems Technology, 23(2), 464-478.
18. Omu, A., Choudhary, R., & Boies, A. (2013). Distributed energy resource system optimisation using mixed integer linear programming. Energy Policy, 61, 249-266.
19. Thies, C., Kieckhäfer, K., Spengler, T. S., & Sodhi, M. S. (2019). Operations research for sustainability assessment of products: A review. European Journal of Operational Research, 274(1), 1-21.
20. Bjorndal, T., Herrero, I., Newman, A., Romero, C., & Weintraub, A. (2012). Operations

research in the natural resource industry. International Transactions in Operational Research, 19(1-2), 39-62.

Άλλη σχετική ενδεικτική βιβλιογραφία
1. Ε.Χ. Φούντας, Α.Γ. Βλάχος (2013) Μαθηματικός Προγραμματισμός και Θεωρία Παιγνίων 1, Μαρκέλλα Ι. Βαρβαρήγου
2. MacKinnon, J. G. (1975). An algorithm for the generalized transportation problem. Regional Science and Urban Economics, 5(4), 445-464.
3. Delson, J. K., & Shahidehpour, S. M. (1992). Linear programming applications to power system economics, planning and operations. IEEE Transactions on Power Systems, 7(3), 1155-1163.
4. Isard, W., Azis, I. J., Drennan, M. P., Miller, R. E., Saltzman, S., & Thorbecke, E. (2017). Methods of interregional and regional analysis. Taylor & Francis.
5. Killen, J. (2021). Mathematical programming methods for geographers and planners. Routledge.
6. Dorfman, R. (2020). Application of Linear Programming to the Theory of the Firm. University of California Press.
7. Patriksson, M. (2015). The traffic assignment problem: models and methods. Courier Dover Publications.
8. Paris, Q. (2016). An economic interpretation of linear programming. Springer.
9. Daniel, S. E., Diakoulaki, D. C., & Pappis, C. P. (1997). Operations research and environmental planning. European journal of operational research, 102(2), 248-263.
10. Swart, W. W., Var, T., & Gearing, C. E. (1978). Operations research applications to tourism. Annals of Tourism Research, 5(4), 414-428.
11. Vidale, M. L., & Wolfe, H. B. (1957). An operations-research study of sales response to advertising. Operations research, 5(3), 370-381.
12. Rardin, R. L., & Rardin, R. L. (1998). Optimization in operations research (Vol. 166). Upper Saddle River, NJ: Prentice Hall.
13. Ecker, J. G., & Kupferschmid, M. (1988). Introduction to operations research. New York: Wiley.
14. Dorfman, R., Samuelson, P. A., & Solow, R. M. (1987). Linear programming and economic analysis. Courier Corporation.

Συναφή επιστημονικά περιοδικά
Operations Research Letters (Elsevier)
European Journal of Operations Research (Elsevier)
Journal of Operational Research Society (Taylor & Francis)
Annals of Operations Research (Springer)
Operations Management Research (Springer)
Operational Research (Springer)
4OR (Springer)
Operations Research Perspectives (Elsevier)
International Journal of Mathematics in Operational Research (Inderscience)
Advances in Operations Research (Hindawi)