<table>
<tr><td colspan="2">NAME OF THE COURSE</td><td colspan="5">QUANTITATIVE METHODS FOR MANAGEMENT</td></tr>
<tr><td>Code</td><td>EUB201</td><td>Year of study</td><td colspan="4">3</td></tr>
<tr><td>Course teacher</td><td>Assoc. Prof. Branka Marasović, PhD,
Prof. Zdravka Aljinović, PhD,
Prof. Blanka Škrabić Perić, PhD</td><td>Credits (ECTS)</td><td colspan="4">5</td></tr>
<tr><td rowspan="2">Associate teachers</td><td rowspan="2">Tea Kalinić, mag. math., Ivana Jerković, mag. math.</td><td rowspan="2">Type of instruction (number of hours)</td><td>L</td><td>S</td><td>E</td><td>F</td></tr>
<tr><td>26</td><td></td><td>26</td><td></td></tr>
<tr><td>Status of the course</td><td>Obligatory</td><td>Percentage of application of e-learning</td><td colspan="4">35</td></tr>
<tr><td colspan="7">COURSE DESCRIPTION</td></tr>
<tr><td>Course objectives</td><td colspan="6">Students will be able to identify and quantify different quantitative methods for solving business management problems with special emphasis on problems that can be presented as problems of linear programming.</td></tr>
<tr><td>Course enrolment requirements and entry competences required for the course</td><td colspan="6">Course signature requirements: as determined by the Statute of the Faculty of Economics and Rules and Regulations for Studies and Study Programmes.</td></tr>
<tr><td>Learning outcomes expected at the level of the course (4 to 10 learning outcomes)</td><td colspan="6">Learning outcome of the subject:
Mathematically formulate different situations and processes in the field of business management that can be reduced to the problems of linear programming and solve the problem of linear programming.

Specific learning outcomes:
1. To solve tasks from vector spaces
2. To mathematically formulate different situations and processes in the field of business management that can be reduced to the problems of linear programming
3. To solve with graphical and simplex method problems of linear programming and present the result of original and dual problem
4. To analyse the sensitivity of the optimal solution of the problem of linear programming to changes in input parameters (carry out sensitivity analysis)
5. To analyse transport and distribution problems</td></tr>
<tr><td>Course content broken down in detail by weekly class schedule (syllabus)</td><td colspan="6"><table>
<tr><td colspan="2">Lectures</td><td colspan="2">Exercises</td></tr>
<tr><td>Topic</td><td>Hours</td><td>Topic</td><td>Hours</td></tr>
<tr><td>Introduction to vectors and vector spaces.</td><td>1</td><td>Introduction to vectors and vector spaces.</td><td>1</td></tr>
<tr><td>Inner products and norms. Linearly dependent and linearly independent vectors.</td><td>1</td><td>Inner products and norms. Linearly dependent and linearly independent vectors</td><td>1</td></tr>
<tr><td>Basis of a vector space. Convex sets.</td><td>2</td><td>Basis of a vector space. Convex sets.</td><td>2</td></tr>
<tr><td>Introduction to linear programming. Graphical method.</td><td>2</td><td>Introduction to linear programming. Graphical method.</td><td>2</td></tr>
<tr><td>The fundamental theorem of linear programming. Duality in linear programming.</td><td>2</td><td>The fundamental theorem of linear programming. Duality in linear programming.</td><td>2</td></tr>
</table></td></tr>
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Application of linear programming models in business decisions.	2	Application of linear programming models in business decisions.	2
Simplex method	2	Simplex method	2
The simplex method: solving standard maximization problem	2	The simplex method: solving standard maximization problems	2
The simplex method: solving standard minimization problem	2	The simplex method: solving standard minimization problem	2
The simplex method: solving general linear programming problem.	2	The simplex method: solving general linear programming problem.	2
Sensitivity analysis for linear programming	2	Sensitivity analysis for linear programming	2
Transportation and distribution problems.	2	Transportation and distribution problems.	2
Classical transportation problem.	2	Classical transportation problem.	2
Assigngnment problems. The traveling salesman problem.	2	Assigngnment problems. The traveling salesman problem.	2

Format of instruction	☑ lectures ☐ seminars and workshops ☑ exercises ☐ *on line* in entirety ☑ partial e-learning ☐ field work	☐ independent assignments ☑ multimedia ☐ laboratory ☐ work with mentor ☑ (other)
Student responsibilities	Students are required to attend classes and actively participate in classes. Students' activity will be monitored through self-evaluation quizzes that will be available to students on the course websites within the Moodle platform. In case the student takes less than two self-evaluation quizzes during the semester and attends less than 50% of lectures and exercises, the student will be denied a signature. The condition for taking the exam is a signature.	

Screening student work *(name the proportion of ECTS credits for each activity so that the total number of ECTS credits is equal to the ECTS value of the course)*						
	Class attendance	2	Research		Practical training	
	Experimental work		Report		Self-evaluation quizzes	0.5
	Essay		Seminar essay		(Other)	
	Tests	1.5*	Oral exam	1	(Other)	
	Written exam	1.5	Project		(Other)	

Grading and evaluating student work in class and at the final exam	1. Exam consists of two parts, the first one is written exam with exercises and the second one is oral exam with theory. The written exam for the practical section is conducted on a computer, as the exercises are also held on a computer, where the entire material is practiced using software tools for linear programming problems. Positively evaluated first part is precondition for approaching the second part of the exam. 2. * During the semester two tests with exercises will be organized. The tests are conducted on a computer. The condition for taking the test is that the student has solved all the self-evaluation quizzes from the part of the material that is evaluated by the test. Once the first part of the exam with exercises is passed (through tests or in regular exam terms) it is valid through the whole academic year.

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<tr><td></td><td colspan="3">Each test brings 50 points Students who achieve at least 50 points from max 100 points (with the condition that in each of two tests have at least 20 points) are free of passing the first part of the exam in the current academic year, and they can directly approach the second part in the regular exam terms.
Key points and appropriate grades for written exam:
0-49 inadequate (1)
50-64 sufficient (2)
65-74 good (3)
75-89 very good (4)
90-100 excellent (5)</td></tr>
<tr><td rowspan="4">Required literature (available in the library and via other media)</td><td>Title</td><td>Number of copies in the library</td><td>Availability via other media</td></tr>
<tr><td>Z. Babić: Linearno programiranje, Ekonomski fakultet Split, 2010.</td><td>10</td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Optional literature (at the time of submission of study programme proposal)</td><td colspan="3">Books:
Robert J. Vanderbei: Linear Programming: Foundations and Extensions, 5th edition, Springer 2020.

L. Neralić: Uvod u matematičko programiranje 1, Element, Zagreb, 2004.

Z. Lukač, L. Neralić: Operacijska istraživanja, Ekonomski fakultet Sveučilišta u Zagrebu, Zagreb, 2012.
C. P. Bonini, W.H. Hausman, H. Bierman: Quantitative analysis for management, McGraw-Hill, 1997.
Lj. Martić: Matematičke metode za ekonomske analize II, Narodne novine, Zagreb, 1979.
Articles:
Babić, Z., T Perić, B. Marasović (2017): Production Planning in the bakery Via De Novo programming Approach, Proceedings of the 14th International Symposium on OPERATIONAL RESEARCH SOR'17, Bled, Slovenia, pp. 481-486
Perić, T., Z. Babić, B. Marasović (2010): Multiobjective Optimization in Production Planning Problem, Proceedings of the 12th International Conference on Operational Research - KOI'08, Pula, Croatia, pp. 213-225
Marasović, B., Z. Babić (2011): Two-step multi-criteria model for selecting optimal portfolio. International Journal of Production Economics, Vol. 134, pp. 58-66</td></tr>
<tr><td>Quality assurance methods that ensure the acquisition of exit competences</td><td colspan="3">Registering students' success in carrying out of their duties (lecturer).
Monitoring lectures and practice sessions (Vice Dean for Education and student affairs).
Students' Performance analysis in each course (Vice Dean for Education and student affairs).
Student questionnaire on the quality of lecturers and lessons for each course (University of Split, Quality Assurance Centre)
Examination is used as an instrument to evaluate individual course outcomes by the course lecturer. The content of exam is reassessed periodically in order to assure compliance with the course outcomes.</td></tr>
<tr><td>Other (as the proposer wishes to add)</td><td colspan="3">The course is taught in Croatian.</td></tr>
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