

**DEPARTMENT of INDUSTRIAL ENGINEERING  
COURSE CATALOGUE FORM**



<b>Course Code:</b> INDE2001				<b>Course Title:</b> Operations Research I			
<b>Semester</b>	<b>L + R + L</b>	<b>Credits</b>	<b>AKTS</b>	<b>Language</b>	<b>Category</b>	<b>Instructional Methods</b>	<b>Prerequisites</b>
3	3+0+2	4	7	English	Required	Lecture + Lab.	MATH2104
<b>Course Objectives</b>			To give basic information about linear programming and integer programming that are main elements of the operations research.				
<b>Course Content</b>			Mathematical modeling concepts. Linear programming, problem formulation, simplex and dual simplex methods, duality and sensitivity analysis. Transport problems, modeling and variations. Network problems and modeling. Target programming. Integer linear programming.				
<b>Course Learning Outcomes</b>			<p>Upon successful completion of this course, students will be able to:</p> <ol style="list-style-type: none"> <li>1. Demonstrate the knowledge about basic techniques of mathematical programming such as linear programming. [2,3]</li> <li>2. Execute special solution techniques and sensitivity analysis developed for linear programming problems. [2,3]</li> <li>3. Solve linear programming problems such as transportation problem and assignment problem sub-types. [2,3]</li> <li>4. Execute the modeling of integer programming problems and special solution techniques. [2,3]</li> <li>5. Use Excel solver and GAMS optimization language to solve optimization problems within computing environment. [4]</li> <li>6. Understand and recognize linear algebra as a way solving linear system of equations.[1]</li> </ol> <p>[Note: The numbers in square brackets indicate the numbers of the corresponding program outputs]</p>				
<b>ISCED Category of the course</b>			52 Engineering				
<b>Textbook</b>			"Operations Research: Applications and Algorithms," Winston.				
<b>Supplementary Material</b>							

**COURSE PLAN**

<b>Week</b>	<b>Topics</b>	<b>Laboratory / Tutorial Work</b>
1	Definition of Operations Research and basic concepts	Review of linear algebra
2	Repeating linear algebra related topics	Mathematical modeling with linear programming (example problems)
3	Introduction to linear programming	Mathematical modeling with linear programming (example problems)
4	Introduction to linear programming	Linear programming with Microsoft Excel
5	Simplex method and target programming	Linear programming with Microsoft Excel
6	Simplex method and target programming	Case study (Excel Solver)
7	Sensitivity analysis - Midterm Exam 1	Linear programming with GAMS software
8	Sensitivity analysis and duality	Linear programming with GAMS software
9	Sensitivity analysis and duality	Linear programming with GAMS software
10	Duality and dual simplex method	Mathematical programming with Integer variables
11	Transportation and assignment problems - Midterm Exam 2	Mathematical programming with Integer variables
12	Transportation and assignment problems	Integer programming and GAMS
13	Integer programming	Integer programming and GAMS
14	Integer programming	Case study (GAMS)

**COURSE ASSESSMENT SYSTEM**

	<b>Activities</b>	<b>Contribution (%)</b>
<b>Semester Activities</b>	<b>Semester Written Exams</b>	60
	<b>Homework</b>	10
	<b>Labs</b>	
	<b>Other (attendance, field trip etc.)</b>	
<b>FINAL EXAM</b>		30
<b>Total</b>		100

**CONTRIBUTION of the COURSE on INDUSTRIAL ENGINEERING PROGRAM OUTCOMES**

	<b>Program Outcomes</b>	Low	High
1	Adequate knowledge in mathematics, science and subjects pertaining to Industrial Engineering; ability to use theoretical and applied knowledge in these areas in complex engineering problems.		
2	Ability to identify, formulate, and solve complex Industrial Engineering problems; ability to select and apply proper analysis and modeling methods for this purpose.		X
3	Ability to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the desired result; ability to apply modern design methods for this purpose.		X
4	Ability to devise, select, and use modern techniques and tools needed for analyzing and solving problems encountered in engineering practice; ability to employ information technologies effectively.		X
5	Ability to design and conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or discipline specific research questions.		
6	Ability to work efficiently individually and in intra-disciplinary / multi-disciplinary teams.		
7	Knowledge of Turkish and English languages; ability to communicate effectively orally, inscriptive and visually by using these languages (via business methods such as reports, presentations and instructions).		
8	Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to continue to educate him/herself.		
9	Consciousness to behave according to ethical principles and professional and ethical responsibility; knowledge on standards used in engineering practice.		
10	Knowledge about business life practices (management activities such as project, risk, change and quality etc.); awareness in entrepreneurship, innovation; knowledge about sustainable development.		
11	Knowledge about the global and social effects of engineering practices on health, environment, economics and safety, and contemporary issues of the century reflected into the field of engineering; awareness of the legal consequences of engineering solutions.		

**ECTS - WORK LOAD TABLE**

<b>COURSE ACTIVITIES</b>	<b>Quantity</b>	<b>Time (hr)</b>	<b>Work Load (hr)</b>
Lectures	14	3	42
Final Exam (Preparation included)	1	25	25
Semester Written Exams (Preparation included)	8	7	56
Out of class study time			
Homework	8	3	24
Reports			
Labs	14	2	28
Seminar			
Presentations			
Term Project			
<b>Total Load (hr)</b>			175
<b>ECTS Credits of the course (Total Work Load / 25)</b>			7

<b>Revision / Date</b> 5/02/2020	<b>Coordinator / Prepared By</b> Kemal Sarıca	<b>Approved By</b> Çağlar Aksezer
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