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| antalya bilim Ã¼niversitesi ile ilgili gÃ¶rsel sonucu | **ECTS Course Description Form** |
| **PART I ( Senate Approval)** |
| **Offering School**  | **College of Engineering** |
| **Offering Department** | **Industrial Engineering** |
| **Program(s) Offered to** | **Industrial Engineering**  |  |
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| **Course Code**  | **IE-462** |
| **Course Name** | **Computational Optimization** |
| **Language of Instruction** | **English** |
| **Type of Course** | **Departmental Area Elective** |
| **Level of Course** | **Undergraduate** |
| **Hours per Week** | **Lecture: 3** | **Laboratory:** | **Recitation: 1** | **Practical:**  | **Studio:** | **Other:** |
| **ECTS Credit** | **6** |
| **Grading Mode** | **Letter Grade** |
| **Pre-requisites** | **IE-202** |
| **Co-requisites** | **-** |
| **Registration Restriction** | *-* |
| **Educational Objective** | 1. Understand basic models of computation and how to use them to analyze the efficiency ofalgorithms.2. Understand the fundamentals of how a computer’s architecture affects theperformance of an algorithms.3. Understand basic programming paradigms and the tools for implementations using these paradigms.4. Understand the data structures that are typically used in optimization algorithms.5. Learn to use basic programming environments and tools |
| **Course Description** | An introduction to nonlinear programming. Models, methods, algorithms, and computer techniques for nonlinear optimization are studied. Students investigate contemporary optimization methods both by implementing these methods and through experimentation with commercial software. Nonmajors wishing to gain practical optimization skills are welcomed in this course. A course project will allow students to explore optimization methods and practical problems directly related to their interests. |
| **Learning Outcomes** | **LO1** | **Upon successful completion of the course, students will be able to:*** Understand *why* optimization is so hard.
* Learn to convert written descriptions into optimization problems.
* Learn to solve optimization problems using black-box software.
* Understand many of the fundmental optimization algorithms, such as quasi-newton methods and linear programming.
* Learn about constrained optimization.
* Understand why convex optimization is an important modern development
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| **LO2** |
| **LO3** |
| **LO4** |
| **LO5** |
| **LO6** |
| **n..** |
| **PART II ( Faculty Board Approval)** |
| **Basic Outcomes (University-wide)** | **No.** | **Program Outcomes** | **LO1** | **LO2** | **LO3** | **LO4** | **LO5** | **LO6** |
| **PO1** | **Ability** to communicate effectively and write and present a report in Turkish and English.  | 🗸🗸🗸🗸🗸🗸🗸🗸🗸🗸🗸🗸🗸🗸🗸🗸🗸🗸🗸🗸   🗸🗸  🗸🗸 |
| **PO2** | **Ability** to work individually, and in intra-disciplinary and multi-disciplinary teams. |
| **PO3** | **Recognition** of the need for life-long learning and **ability** to access information , follow developments in science and technology, and continually reinvent oneself. |
| **PO4** | **Knowledge** of project management, risk management, innovation and change management, entrepreneurship, and sustainable development. |
| **PO5** | **Awareness** of sectors and **ability** to prepare a business plan. |
| **PO6** | **Understanding** of professional and ethical responsibility and **demonstrating** ethical behavior. |
| **Faculty Specific Outcomes** | **PO7** | Ability to develop, select and use modern techniques and tools necessary for engineering applications and ability to use information technologies effectively. |
| **PO8** | Recognition of the effects of engineering applications on health, environment and safety in the universal and societal dimensions and the problems of the time and awareness of the legal consequences of engineering solutions. |
| **PO9** | Ability to identify, define, formulate and solve complex engineering problems; and electing and applying appropriate analysis and modeling methods for this purpose. |
| **Discipline Specific Outcomes (program)** | **PO10** | Sufficient knowledge in mathematics, science and engineering and the ability to apply theoretical and practical knowledge in these areas to model and solve engineering problems. |
| **PO11** | Ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions of economic, environmental, sustainability, manufacturability, ethics, health, safety, social and political issues; and the ability to apply modern design methods for this purpose.  |
| **PO12** | Ability to design experiments, conduct experiments, collect data, analyze and interpret results for the examination of engineering problems. |
| **Specialization Specific Outcomes** | **PO N….** |  |
| **PART III ( Department Board Approval)** |
| **Course Subjects, Contribution of Course Subjects to Learning Outcomes, and Methods for Assessing Learning of Course Subjects** | **Subjects** | **Week** |  | **LO1** | **LO2** | **LO3** | **LO4** | **LO5** | **LO6** |
| **S1** | 1 | Modeling with integer variables:correct formulations | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* |  |
| **S2** | 2 | Optimality, relaxation, bounds, search: branch–and–bound | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* |  |
| **S3** | 3 | Choices in modeling: strong formulations, extended formulations Preprocessing of formulations | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* |  |
| **S4** | 4 | Describing polyhedra with extreme points and extreme rays Connections between integer programming and polyhedra | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* |  |
| **S5** | 5 | Lagrangian relaxationSubgradient optimization | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* |  |
| **S6** | 6 | Applications: traveling salesman problem, facility location problems, generalized assignment problem | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* |  |
| **S7** | 7 | Dantzig–Wolfe decomposition, column generation Applications: generalized assignment and multicommodity flow problems, Benders decomposition Applications: facility location, network design problems | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* |  |
| **S8** | 8 | **Midterm Exam** | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* |  |
| **S9** | 9 | Integer and mixed–integer rounding | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* |  |
| **S10** | 10 | Gomory cuts, disjunctive cuts | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* |  |
| **S11** | 11 | Affine independence, dimension and faces of polyhedraStrong valid inequalities, facets | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* |  |
| **S12** | 12 | Valid inequalities for set packing and 0–1 knapsack problems and their separation | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* |  |
| **S13** | 13 | Sequential lifting Sequence independent lifting, Applications: airline crew scheduling,production lot–sizing,facility location problems | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* |  |
| **S14** | 14 | Network Design | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* | *A1-A2-A3* |  |
| **Assessment Methods, Weight in Course Grade, Implementation and Make-Up Rules**  | **No.** | **Type** | **Weight** | **Implementation Rule** | **Make-Up Rule** |
| **A1** | **Exam** | 70 | No electronic devices are allowed in the examinations except the calculator | If the reason for not taking the exam is justified by the school, the student is informed about the time of the make-up exam. |
| **A2** | **Quiz** | 20 | It is given at any time without informing to the students*.* | The compensation of he quizzes is valid in case of special situations. |
| **A3** | **Homework** | 10 | Homeworks are given by announcing deadline. Homeworks that are submitted after the deadline are not accepted. | There is no compensation for the homeworks. |
| **A4** | **Project** |  |  |  |
| **A5** | **Report** |  | - | - |
| **A6** | **Presentation** |  | - | - |
| **A7** | **Attendance/ Interaction** |  | - | - |
| **A8** | **Class/Lab./****Field Work** |  | - | - |
| **A9** | **Other** |  |  |  |
| **TOTAL** | **100%** |
| **Evidence of Achievement of Learning Outcomes** | Letter grades determined by weighting on the specified percentages on the grades that are taken from exams, quizzes and homeworks by the students.The teaching staff can make changes in the student's grades. |
| **Method for Determining Letter Grade** |

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| **Activities** | Midterm Exams | Quizzes | Homeworks | Final Exam |
| **Quantity** | 1 | 10 | 2 | 1 |
| **Effects on Grading, %)** | 30 | 20 | 10 | 40 |

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| **Teaching Methods, Student Work Load** | **No** | **Method** | **Explanation** | **Hours** |
| ***Time applied by instructor*** |
| **1** | **Lecture** |  | 3x14 |
| **2** | **Interactive Lecture** |  |  |
| **3** | **Recitation** |  | 1x14 |
| **4** | **Laboratory** |  |  |
| **5** | **Practical** |  |  |
| **6** | **Field Work** |  |  |
| ***Time expected to be allocated by student*** |
| **7** | **Project** |  |  |
| **8** | **Homework** |  | 20 |
| **9** | **Pre-class Learning of Course Material**  |  | 45 |
| **10** | **Review of Course Material** |  | 60 |
| **11** | **Studio** |  |  |
| **12** | **Office Hour** |  |  |
| **TOTAL** |  |
| **IV. PART** |
| **Instructor** | **Name** | Hakan Şimşek |
| **E-mail** | hakan.simsek@antalya.edu.tr |
| **Phone Number** | 0544 445 07 67  |
| **Office Number** | A1-26 |
| **Office Hours** | It will be determined during the semester. |
| **Course Materials** | **Mandatory** |  |
| **Recommended** |  |
| **Other** | **Scholastic Honesty** | Violations of scholastic honesty include, but are not limited to cheating, plagiarizing, fabricating information or citations, facilitating acts of dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students. Any for of scholastic dishonesty is a serious academic violation and will result in a disciplinary action. |
| **Students with Disabilities** | Reasonable accommodations will be made for students with verifiable disabilities. |
| **Safety Issues**  | The course does not require any special safety precautions. |
| **Flexibility** | Circumstances may arise during the course that prevents the instructor from fulfilling each and every component of this syllabus; therefore, the syllabus is subject to change.  Students will be notified prior to any changes.  |