İZMİR UNIVERSITY OF ECONOMICS

# Faculty of Engineering
## Computer Engineering
## IE 357 - Special Topics in Optimization

### COURSE INTRODUCTION AND APPLICATION INFORMATION

| Course Name | Special Topics in Optimization |
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| Code | Semester | Theory (hour/week) | Application/Laboratory (hour/week) | Local Credits | ECTS |
|---|---|---|---|---|---|
| IE 357 | Fall/Spring | 3 | 0 | 3 | 6 |

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| **Prerequisites** | IE 252 To succeed (To get a grade of at least DD) |
| **Course Language** | English |
| **Course Type** | Elective |
| **Course Level** | First Cycle |
| **Mode of Delivery** | - |
| | * Lecturing / Presentation |
| **Course Coordinator** | * Doç. Dr. Selin ÖZPEYNİRCİ |
| **Course Lecturer(s)** | * Doç. Dr. Selin ÖZPEYNİRCİ |
| **Course Assistants** | - |

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| **Course Objectives** | To teach students optimization methods and modelling techniques not taught in compulsory courses |
| **Course Learning Outcomes** | The students who succeeded in this course;<br>* Will be able to describe the limitations of classical optimization methods<br>* Will be able to model production management and industrial systems engineering field problems using these methods<br>* Will be able to model production management and industrial systems engineering field problems using dynamic programming<br>* Will be able to model production management and industrial systems engineering field problems using hybrid optimization methods |

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| | * Will be able to solve these production management and industrial systems engineering field problems models' using appropriate software |
| **Course Description** | In this course, students will have the chance to learn certain optimization subjects, methods and models which are not covered in compulsory courses. At the end students will also have the chance to learn applications of these models and methods. |

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| **Course Category** | Core Courses | |
| | Major Area Courses | X |
| | Supportive Courses | |
| | Media and Managment Skills Courses | |
| | Transferable Skill Courses | |

## WEEKLY SUBJECTS AND RELATED PREPARATION STUDIES

| Week16 | Subjects | Related Materials |
|---|---|---|
| **1** | Fundamentals of Optimization Review | Lecture Notes |
| **2** | Large Scale Optimization Solution methods  LP Relaxation | Lecture Notes |
| **3** | Large Scale Optimization Solution methods  LP Relaxation | Lecture Notes |
| **4** | Large Scale Optimization Solution methods Dantzig Wolfe | Lecture Notes |
| **5** | Large Scale Optimization Solution methods B&B | Lecture Notes |
| **6** | Large Scale Optimization Solution methods B&B | Lecture Notes |
| **7** | Large Scale Optimization Solution methods Lagrangian Relaxation | Lecture Notes |
| **8** | Large Scale Optimization Solution methods Lagrangian Relaxation | Lecture Notes |
| **9** | Midterm | |
| **10** | Large Scale Optimization Solution methods Cutting Plane | Lecture Notes |
| **11** | Large Scale Optimization Solution methods Bender Decomposition | Lecture Notes |
| **12** | Dynamic Programming | Lecture Notes |
| **13** | Dynamic Programming | Lecture Notes |
| **14** | Dynamic Programming | Lecture Notes |
| **15** | Review and Presentations | Lecture Notes |
| **16** | Review of the Semester | |

## SOURCES

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| **Course Notes / Textbooks** | Lecture Notes |
| **Suggested Readings/Materials** | Wolsey, Laurence A. Integer programming. Vol. 52. John Wiley & Sons, 1998. ISBN:978-0471283669 |

## EVALUATION SYSTEM

| **Semester Activities** | **Number** | **Percentage of Grade** |
|---|---|---|
| Participation | - | - |
| Laboratory / Application | - | - |
| Field Work | - | - |
| Quiz/Studio Critic | - | - |
| Portfoilo | - | - |
| Homework Assignment | - | - |
| Presentation/Jury | - | - |
| Project | - | - |
| Seminar/Workshop | - | - |
| Oral Exam | - | - |
| Midterm | 2 | 60 |
| Final | 1 | 40 |
| **Total** | 3 | 100 |

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| **WEIGHTING OF SEMESTER ACTIVITIES ON THE FINAL GRADE** | **2** | **60** |
| **WEIGHTING OF END-OF-SEMESTER ACTIVITIES ON THE FINAL GRADE** | **1** | **40** |
| **Total** | 3 | 100 |

## ECTS / WORKLOAD TABLE

| Semester Activities | Number | Duration (Hours) | Total Workload |
|---|---|---|---|
| Course Hours (Including Exam Week: 16 x Total Hours) | 16 | 3 | 48 |
| Laboratory / Application Hours | 16 | - | - |
| Study Hours Out of Class | 14 | 4 | 56 |
| Field Work | - | - | - |
| Quiz / Studio Critique | - | - | - |
| Portfolio | - | - | - |
| Homework / Assignment | - | - | - |
| Presentation / Jury | - | - | - |
| Project | - | - | - |
| Seminar / Workshop | - | - | - |
| Oral Exam | - | - | - |
| Midterm | 2 | 22 | 44 |
| Final | 1 | 32 | 32 |
| | | **Total Workload** | **180** |

## THE RELATIONSHIP BETWEEN COURSE LEARNING OUTCOMES AND PROGRAM QUALIFICATIONS

| # | Program Qualifications / Outcomes | * Level of Contribution | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | To have adequate knowledge in Mathematics, Science and Computer Engineering; to be able to use theoretical and applied information in these areas on complex engineering problems. | | | | | |
| 2 | To be able to identify, define, formulate, and solve complex Computer Engineering problems; to be able to select and apply proper analysis and modeling methods for this purpose. | | | | | |
| 3 | To be able to design a complex system, process, device or product under realistic constraints and conditions, in such a way as to meet the requirements; to be able to apply modern design methods for this purpose. | | | | | |
| 4 | To be able to devise, select, and use modern techniques and tools needed for analysis and solution of complex problems in Computer Engineering applications; to be able to use information technologies effectively. | | | | | |
| 5 | To be able to design and conduct experiments, gather data, analyze and interpret results for investigating complex engineering problems or Computer Engineering research topics. | | | | | |
| 6 | To be able to work efficiently in Computer Engineering disciplinary and multi-disciplinary teams; to be able to work individually. | | | | | |
| 7 | To be able to communicate effectively in Turkish, both orally and in writing; to be able to author and comprehend written reports, to be able to prepare design and implementation reports, to present effectively, to be able to give and receive clear and comprehensible instructions. | | | | | |
| 8 | To have knowledge about global and social impact of Computer Engineering practices on health, environment, and safety; to have knowledge about contemporary issues as they pertain to engineering; to be aware of the legal ramifications of Computer Engineering solutions. | | | | | |
| 9 | To be aware of ethical behavior, professional and ethical responsibility; to have knowledge about standards utilized in engineering applications. | | | | | |
| 10 | To have knowledge about industrial practices such as project management, risk management, and change management; to have awareness of entrepreneurship and innovation; to have knowledge about sustainable development. | | | | | |
| 11 | To be able to collect data in the area of Computer Engineering, and to be able to communicate with colleagues in a foreign language. ("European Language Portfolio Global Scale", Level B1) | | | | | |
| 12 | To be able to speak a second foreign language at a medium level of fluency efficiently. | | | | | |

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| **13** | To recognize the need for lifelong learning; to be able to access information, to be able to stay current with developments in science and technology; to be able to relate the knowledge accumulated throughout the human history to Computer Engineering. | | | | | |

*1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest