**ABDULLAH GÜL UNIVERSITY**
**GRADUATE SCHOOL OF ENGINNERING & SCIENCE**
**INDUSTRIAL ENGINEERING DEPARTMENT**
**COURSE DESCRIPTION AND APPLICATION INFORMATION**

| Course Name | Code | Semester | T+P (Hour) | Credit | ECTS |
|---|---|---|---|---|---|
| Stochastic Programming | IE 532 | Fall-Spring | 0 + 2 | 3 | 10 |

| Prerequisites | IE 511 Modeling and Optimization (or equivalent), IE 521 Probability Theory (or equivalent) |
|---|---|

| Course Type | Elective |
|---|---|
| Course Language | English |
| Course Coordinator | Assist. Prof. Selçuk Gören |
| Course Instructor | Assist. Prof. Selçuk Gören |
| Course Assistant | |
| Course Objective | This course deals with optimization under data uncertainty. It is intended for the students to give a detailed introduction about stochastic programming with modelling, theoretical results and computational methods |
| Course Learning Outcomes | A student who successfully completes this course, 1. Applies the basic modeling methods of stochastic programming, differantiates the differences between them, 2. Formulates the deterministic equivalent of a stochastic model, 3. Applies the methods used for the complete solution, 4. Applies the methods used for predictive solutions, 5. Lists the methods used to solve integer models. |
| Course Content | Two-stage stochastic linear programs, Chance-constrained stochastic programs, L-shaped method with improved stages, Monte-Carlo methods |

| WEEKLY SUBJECTS AND RELATED PRELIMINARY PREPARATION PAGES | | |
|---|---|---|
| Week | Subjects | Preliminary |
| 1 | Modeling, deterministic equivalent formulation | |
| 2 | Two-stage stochastic linear programming | |
| 3 | Chance-constrained stochastic programs, | |
| 4 | Multi-stage stochastic linear programs | |
| 5 | Integer stochastic programs | |
| 6 | Expected value of perfect information, Value of stochastic solution. | |
| 7 | L-Shaped Algorithm | |
| 8 | Advanced techniques, regularized decomposition method, trickling down, bundle-trust region method | |
| 9 | Midterm, Progress report and presentation | |
| 10 | Solution methods for multi-stage stochastic programs | |
| 11 | Solution methods for integer stochastic programs | |
| 12 | Upper and lower bounds, Monte-Carlo, Edmundson-Madansky inequalities | |
| 13 | Monte-Carlo Methods | |
| 14 | Multistage Stochastic Programs | |
| 15 | Project Final Presentation | |
| 16 | Final Exam | |

| SOURCES | |
|---|---|
| Lecture Notes | Slides will be shared with the students during the semester via Canvas. |
| Other Sources | **Textbook:** Birge, John R., and Louveaux, François. *Introduction to Stochastic Programming*. Springer, 2011.<br><br>**Supplementary Textbook:** Shaprio, Alexander, Dentcheva, Darinka, and Ruszczyński, Adrej. *Lectures on Stochastic Programming Modeling and Theory*. SIAM and MPS, 2009.<br>Kaynak Kitap: Kall, Peter, and Mayer, János. *Stochastic Linear Programming: Models, Theory,* |

*and Computation*. Springer, 2011.
Articles

| MATERIAL SHARING | |
|---|---|
| **Documents** | Slides will be shared with the students during the semester via Canvas. |
| **Homework** | Slides will be shared with the students during the semester via Canvas. |
| **Exams** | There will be 1 midterm and 1 final exam, with 2 exams in total. |

| EVALUATION SYSTEM | | |
|---|---|---|
| **ACTIVITIES** | **QUANTITY** | **WEIGHT** |
| Midterm Exam | 1 | %20 |
| Quiz | 5 | %15 |
| Homework | 5 | %15 |
| Project | 1 | %20 |
| Final Exam | 1 | %30 |
| **TOTAL** | | %100 |
| **Term Activities Percentage** | | %70 |
| **Final Exam Percentage** | | %30 |
| **TOTAL** | | %100 |

| Course Category | |
|---|---|
| Natural Sciences and Mathematics | %30 |
| Engineering Sciences | %70 |
| Social Sciences | %0 |

| LEARNING OUTCOMES AND PROGRAM QUALIFICATIONS RELATIONSHIP | | | | | | | |
|---|---|---|---|---|---|---|---|
| No | Program Qualification | Contribution Level | | | | | |
| | | 1 | 2 | 3 | 4 | 5 | |
| 1 | PQ1. | | | | | X | |
| 2 | PQ2. | | | | X | | |
| 3 | PQ3. | | X | | | | |
| 4 | PQ4. | | | X | | | |
| 5 | PQ5. | | | | X | | |
| 6 | PQ6. | | | X | | | |

*Increasing from 1 to 5.

| ECTS / WORK LOAD TABLE | | | |
|---|---|---|---|
| Activities | Activity | Duration (Hour) | Totoal Work Load |
| Course Duration (including exam week: 16x total course hours) | | 3 | 48 |
| Out-of-class Study Time (Pre-study, practice) | | 4 | 64 |
| Reading | | 1 | 16 |
| Internet browsing, library work | | 1 | 10 |
| Project Work | | 5 | 50 |
| Report Preperation | | 15 | 30 |
| Presentation Preperation | | 5 | 5 |
| Presention | | 2 | 4 |
| Homeworks | | 5 | 25 |
| Quizzez | | 0,2 | 1 |
| Mid Terms | | 20 | 20 |
| Final Exam | | 30 | 30 |
| **Total Work Load** | | | 303 |

| | | | |
|---|---|---|---|
| **Total Work Load / 30** | | | 10.1 |
| **Course ECTS CREDİT** | | | 10 |