|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Course Details | | | | | | | | | | | | | | | | | | | |
| Code | | | | | | | | | | | | | | **Academic Year** | | | | | **Semester** |
| BE012 | | | | | | | | | | | | | | 2021-2022 | | | | |  |
| Title | | | | | | | | | | | | | | **T** | **A** | | **L** | | **ECTS** |
| Nonlinear Programming | | | | | | | | | | | | | | 3 | 1 | | 0 | | 10 |
|  | | | | | | | | | | | | | | | | | | | |
| Language | | | | | English | | | | | | | | | | | | | | |
| Level | | | | | **Master** |  | | | **Doctorate** | | | **X** | | | | | | | |
| Department / Program | | | | | PhD in Business and Economics | | | | | | | | | | | | | | |
| Forms of Teaching and Learning | | | | |  | | | | | | | | | | | | | | |
| Course Type | | | | | **Compulsory** | | |  | | | | | **Elective** | | | | | **X** | |
| Objectives | | | | | In this course, the students learn to solve unconstrained nonlinear optimization problems optimization problems with equality and / or inequality constraints and to use various techniques used in this field. | | | | | | | | | | | | | | |
| Content | | | | | Optimization problem, classical optimization, constrained optimization and Lagrange multipliers, inequality constrained optimization, one-dimensional optimization, unconstrained gradient techniques, constrained gradient techniques, penalty function methods, quadratic programming, integer programming, large-scale programming | | | | | | | | | | | | | | |
| Prerequisites | | | | |  | | | | | | | | | | | | | | |
| Coordinator | | | | |  | | | | | | | | | | | | | | |
| Lecturer(s) | | | | |  | | | | | | | | | | | | | | |
| Assistant(s) | | | | |  | | | | | | | | | | | | | | |
| Work Placement | | | | |  | | | | | | | | | | | | | | |
| Recommended or Required Reading | | | | | | | | | | | | | | | | | | | |
| Books / Lecture Notes | | | Wismer, D. A., Chattergy, R., Introduction to Nonlinear Optimization, Elsevier North-Holland, Inc. 1978.  Ulbrich, M., Ulbrich, S., Nichtlineare Optimierung. Springer, 2012.  Alt, W., Nichtlineare Optimierung: Eine Einführung in Theorie, Verfahren und Anwendungen. Springer, 2013. | | | | | | | | | | | | | | | | |
| Other Sources | | |  | | | | | | | | | | | | | | | | |
| Additional Course Material | | | | | | | | | | | | | | | | | | | |
| Documents | | |  | | | | | | | | | | | | | | | | |
| Assignments | | |  | | | | | | | | | | | | | | | | |
| Exams | | |  | | | | | | | | | | | | | | | | |
| Course Composition | | | | | | | | | | | | | | | | | | | |
| Social Sciences | | |  | | | | | | | | | | | | | 30% | | | |
| Educational Sciences | | |  | | | | | | | | | | | | | % | | | |
| Natural Sciences | | |  | | | | | | | | | | | | | % | | | |
| Health Sciences | | |  | | | | | | | | | | | | | % | | | |
| Expert Knowledge | | |  | | | | | | | | | | | | | 70% | | | |
| Assessment | | | | | | | | | | | | | | | | | | | |
| Activity | | | **Count** | | | | | | | | | | | | | **Percentage (%)** | | | |
| Midterm Exam | | | 1 | | | | | | | | | | | | | 40% | | | |
| Quiz | | |  | | | | | | | | | | | | | % | | | |
| Assignments | | |  | | | | | | | | | | | | | % | | | |
| Attendance | | |  | | | | | | | | | | | | | % | | | |
| Recitations | | |  | | | | | | | | | | | | | % | | | |
| Projects | | |  | | | | | | | | | | | | | % | | | |
| Final Exam | | | 1 | | | | | | | | | | | | | 60% | | | |
| Total | | | | | | | | | | | | | | | | **100** | | | |
| ECTS Points and Work Load | | | | | | | | | | | | | | | | | | | |
| Activity | | | **Count** | | | | | | | | **Duration** | | | | | **Work Load (Hours)** | | | |
| Lectures | | | 14 | | | | | | | | 3 | | | | | 42 | | | |
| Self-Study | | | 14 | | | | | | | | 4 | | | | | 56 | | | |
| Assignments | | |  | | | | | | | |  | | | | |  | | | |
| Presentation / Seminar Preparation | | | 2 | | | | | | | | 30 | | | | | 60 | | | |
| Midterm Exam | | | 1 | | | | | | | | 44 | | | | | 44 | | | |
| Recitations | | | 14 | | | | | | | | 1 | | | | | 14 | | | |
| Laboratory | | |  | | | | | | | |  | | | | |  | | | |
| Projects | | |  | | | | | | | |  | | | | |  | | | |
| Final Exam | | | 1 | | | | | | | | 64 | | | | | 64 | | | |
| Total Work Load | | | | | | | | | | | | | | | | **280** | | | |
| ECTS Points (Total Work Load / 28) | | | | | | | | | | | | | | | | **10** | | | |
| Course Learning Outcomes | | | | | | | | | | | | | | | | | | | |
| 1 | Students can solve unconstrained optimization problems and optimization problems with equality and / or inequality constraints . | | | | | | | | | | | | | | | | | | |
| 2 | Students can apply various techniques used in the field of nonlinear optimization. | | | | | | | | | | | | | | | | | | |
| Weekly Content | | | | | | | | | | | | | | | | | | | |
| 1 | Optimization problem | | | | | | | | | | | | | | | | | | |
| 2 | Classical optimization | | | | | | | | | | | | | | | | | | |
| 3 | Classical optimization | | | | | | | | | | | | | | | | | | |
| 4 | Constrained optimization and Lagrange multipliers | | | | | | | | | | | | | | | | | | |
| 5 | Constrained optimization and Lagrange multipliers | | | | | | | | | | | | | | | | | | |
| 6 | Optimization with inequality constraints and the Kuhn-Tucker Theorem | | | | | | | | | | | | | | | | | | |
| 7 | Optimization with inequality constraints and the Kuhn-Tucker Theorem | | | | | | | | | | | | | | | | | | |
| 8 | Mid-term Exam | | | | | | | | | | | | | | | | | | |
| 9 | One-dimensional search methods | | | | | | | | | | | | | | | | | | |
| 10 | Unconstrained gradient techniques | | | | | | | | | | | | | | | | | | |
| 11 | Constrained gradient techniques | | | | | | | | | | | | | | | | | | |
| 12 | Penalty function methods | | | | | | | | | | | | | | | | | | |
| 13 | Quadratic programming | | | | | | | | | | | | | | | | | | |
| 14 | Integer programming | | | | | | | | | | | | | | | | | | |
| 15 | Large-scale programming | | | | | | | | | | | | | | | | | | |
| Contribution of Learning Outcomes to Program Objectives (1-5) | | | | | | | | | | | | | | | | | | | |
| CLO | **P1** | | | **P2** | | | **P3** | | |
| 1 | 5 | | | 5 | | | 5 | | |
| 2 | 5 | | | 5 | | | 5 | | |
| Contribution Level | | 1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | | |
| Compiled by: | | Dr. Mehmet Hakan Özdemir | | | | | | | | | | | | | | | | | |
| Date of Compilation: | | 16.05.2021 | | | | | | | | | | | | | | | | | |