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| 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 |
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