**EASTERN MEDITERRANEAN UNIVERSITY**

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| **COURSE CODE** | *IENG 518* | **COURSE LEVEL** | *Fall 2018-2019* |
| **COURSE TITLE** | Nonlinear Programming |
| **COURSE TYPE** | *Elective* |
| **LECTURER(S)** | Dr. Béla Vizvári |
| **CREDIT VALUE** | 3 credits | **ECTS VALUE** |   |
| **PREREQUISITES** | - |
| **COREQUISITES** | - |
| **DURATION OF COURSE** | 1 semester |
| **WEB LINK** | - |
| **CATALOGUE DESCRIPTION**Local and global optima. Newton-type, quasi-Newton, and conjugate gradient methods for unconstrained optimization. Kuhn-Tucker theory and Lagrangean duality. Algorithms for linearly constrained optimization, including steepest ascent and reduced gradient methods with applications to linear and quadratic programming. Interior point methods. Non-linearly constrained optimization including penalty and barrier function methods, reduced and projected gradient methods, Lagrangean methods. Computer implementation. |
| **AIMS & OBJECTIVES**The main aim of this course is to provide students with the necessary knowledge of nonlinear programming: * Basics of convex analysis.
* Optimality conditions.
* Duality.
* Unconstrained and constrained optimization.
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| **GENERAL LEARNING OUTCOMES (COMPETENCES)**On successful completion of this course, all students will have developed **knowledge** and **understanding** of:* Methods of nonlinear programming.

On successful completion of this course, all students will have developed **their skills in**:* Carry out calculation in nonlinear programming.
* Apply of nonlinear programming.

On successful completion of this course, all students will have developed their appreciation of and respect for **values and attitudes** regarding the issues of:* Nonlinear analysis.
* Proving theorems in higher mathematics.
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| **GRADING CRITERIA**Grading is based on home works, one midterm paper and a final paper and voluntary home work.  |
| **RELATIONSHIP WITH OTHER COURSES**N/A |
| **LEARNING / TEACHING METHOD**Lectures, problem-sheet assignments, tutorials. |
| **ASSIGNMENTS** |
| **METHOD OF ASSESSMENT**Midterm : 30%Home works 30%Final : 40%**+** voluntary home works (They are voluntary both for teacher and students) |
| **ATTENDANCE**1. Attendance is mandatory. Any student who has poor attendance and/or misses an examination without providing a valid excuse will be given **NG** grade.
2. Students missing an examination should provide a valid excuse within three days following the examination they missed. One make-up examination will be given at the end of the semester after the final examination period.
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| **TEXTBOOK/S**Mokhtar S. Bazaraa, Hanif D. Sherali, C. M. Shetty, *Nonlinear Programming (Theory and Algorithms), Second Edition,* J. Wiley & Sons, 1993.Dimitri P. Bertsekas, *Nonlinear Programming,* Athena Scientific, 1995. |
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| **CONTENT & SCHEDULE**Lectures will be held on *Wednesdays (10:30-13:20) in IE-E201.* The lecture topics within the semester are as in the following schedule although minor changes are possible:

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| **WEEK** | **TOPICS** |
| 1 | Introduction and Convex Analysis I. |
| 2 | Convex Analysis II |
| 3 | Optimality Conditions I |
| 4 | Optimality Conditions II |
| 5 | Constraint Qualification |
| 6 | Lagrangean Duality (Theory) |
| 7 | Lagrangean Duality (Algorithms; Bertsekas) |
| 8 | Unconstrained Optimization: Linear Search |
| 9 | **Midterm Exam** |
| 10 | Unconstrained Optimization: Multidimensional Search |
| 11 | Unconstrained Optimization: Newton’s Method |
| 12 | Penalty and Barrier Functions |
| 13 | Method of Feasible Direction |
| 14 |  Duality (Bertsekas) |
| 15 |  Special Problems |
| 16 | **FINAL EXAM WEEK** |

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| **PLAGIARISM**This is intentionally failing to give credit to sources used in writing regardless of whether they are published or unpublished. Plagiarism (which also includes any kind of cheating in exams) is a disciplinary offence and will be dealt with accordingly.) |