Program	Level	First cycle
	Name of the program	Pure Mathematics, Applied Mathematics

COURSE

Course title	**Convex Analysis and Applications**			
Course code	Semester	Course status	ECTS	Contact hours (L+AE+LE)
AMAT 345	IV	Elective course	4	2+2+0
Lecturer				
Course Goals	This module aims to introduce students to the concepts of convex analysis and its applications, especially in economics. As part of this module, the following will be done: convex sets and geometry, convex functions on R^n, convex programming and non-convex optimization. After completing the module, the student will be familiar with the concepts of convex analysis and its applications.			
Learning Outcomes	On completion of the course, the student should be able to: Understand and identify the practical problems that can be solved using the course syllabus methods. Use the presented methods to solve practical optimization problems			

COURSE CONTENT

Introduction, basic convexity concepts (convex sets, epigraphs, convex functions, closed/lower semicontinuous functions, differentiable convex functions, convex and affine hulls. Convex function (epigraphical, convexity-preserving operations, infimal convolution, smoothing, differentiable and nondifferentiable functions, support functions: correspondence with convex sets; norms and duals, conjugate functions). Monotonicity of subgradients, normal cones, sampling of subdifferential calculus, start constrained optimality, Conic approximations, Lagrange multiplier conditions for equality constraints. Kuhn-Tucker theory. Numerical optimization methods.

LITERATURE

[1] A. L. Peressini, F. E. Sullivan, J. J. Uhl, The Mathematics of Nonlinear Programming, Springer Verlag, 1993.
[2] M. S. Bazaraa, H. D. Sherali, C. M. Shetty, Nonlinear Programming: Theory and Algorithms, John Wiley, 1993.
[3] J. - B. Hiriart-Urruty, C. Lemarechal, Convex Analysis and Minimization Algorithms, Springer Verlag, 1993.
[4] R. T. Rockafellar, Convex Analysis, Princeton University Press, 1970.
[5] J. Stoer, C. Witzgall, Convexity & Optimization in Finite Dimensions I, Springer Verlag, 1970.

STUDENT WORKLOAD (hours in a semester)

Lectures	45	Tutorial	30	Individual work	75	T o t a l	175

GRADING

Criterion	Maximum points	Minimum points
Midterm exams	50	25
Homework assignment	-	-
Project	-	-
Laboratory assignments	-	-
Final exam	50	30
T o t a l	100	55

REMARKS

Midterm exam: only once in semester (end of November or first week of December). Students altogether write 120 minutes long test. This test is evaluated by max 50 points. The minimal score of the test is 25 points.

Final exam: Students who do not reach the midterm exam minimal score must take the entire course in the final exam. In this case, the final exam is evaluated by max 100 points. The final exam's minimal score is 55 points. Students who reach the midterm exam minimal score take only the part of the final exam that is not covered by the midterm test. In this case, the final exam is evaluated by max 50 points. The minimal score is 30 points.