

Program	Level	Third cycle				
	Name of the program	SEE Doctoral Studies in Mathematical Science				
COURSE						
Course title	Constrained and Unconstrained Optimization					
Course code	Semester	Course status	ECTS	Contact hours (L+AE+LE)		
AMAT 610	I	Elective course	10	30		
Lecturer						
Course Goals	This course includes an overview of various methods for solving various optimization problems, such as constrained and unconstrained optimization problems. Students should master critical theoretical results and multiple algorithms for solving challenging optimization problems. It is planned that some of the topics suitable for research in the mentioned field will be presented during the course.					
COURSE CONTENT						
<ol style="list-style-type: none"> 1. Optimization in general. 2. multi-criteria optimization. 3. Mathematical foundations of optimization algorithms. 4. Unconstrained optimization techniques: linear search, confidence regions, conjugate gradient, Quasi-Newton method, BFGS method, etc. 5. Local and global methods in unconstrained optimization. 6. Nonlinear conjugate methods for solving unconstrained optimization problems. 7. Optimization algorithms without gradients. 8. Optimization through evolutionary algorithms and swarm intelligence methods. 9. Optimization through robust metaheuristics. 10. Nature-inspired algorithms for solving a comprehensive class of optimization problems. 11. Constrained optimization in general: optimization conditions, linear programming, interior point method, quadratic programming, SQP methods, optimization with PDE conditions. 12. Techniques to deal with limitations in constrained optimization. 13. One-dimensional optimization methods. 14. Methods in nonlinear constrained optimization. 15. Global optimization methods in unconstrained optimization. 						
LITERATURE			GRADING			
<ol style="list-style-type: none"> [1] Sergiy Butenko, Panos M. Pardalos, Numerical Methods and Optimization: An Introduction, CRC Press, 2014. [2] Neculai Andrei, Nonlinear Conjugate Gradient Methods for Unconstrained Optimization, Springer Nature Switzerland AG, 2020. [3] Shashi Kant Mishra, Bhagwat Ram, Introduction to Unconstrained Optimization with R, Springer Nature Singapore Pte Ltd. 2019. [4] Xin-She Yang, Optimization Techniques and Applications with Examples, JohnWiley & Sons, Inc, 2018. [5] Xin-She Yang, Nature-Inspired Computation and Swarm Intelligence Algorithms, Theory and Applications, London, United Kingdom, Academic Press, 2020. [6] Stefan Schaffler, Global Optimization: A Stochastic Approach, Springer Science Business Media New York, 2012. 			Criterion	Maximum points	Minimum points	
			1.	Assignment		
			2.	Projects	40	20
			3.	Final exam	60	35
			Total		100	55