Lahore University of Management Sciences

EE 563 – Convex Optimization

Spring 2020

Course Description
This course focuses on theory, algorithms and applications of convex optimization. Convex optimization deals with the non-linear optimization problems where the objective function and the constraints of the problem are both convex. These problems appear in a variety of applications in diverse fields of science and engineering (e.g., statistics, signal/image processing, wireless communications, computational neuroanatomy, machine learning, and computational geometry, to name a few). Students will be given training to recognize, model and formulate the convex optimization problems. Topics include: review of least-squares, linear programming, convex sets and functions, convexity with reference to inequalities, linear optimization problems, quadratic optimization problems, geometric programming, duality (Lagrange dual function), norm approximation, regularized approximation, geometric problems, Algorithms (descend, Newton, interior-point). Implementation of optimization algorithms will be carried out in CVX (MATLAB based software for convex optimization).

Course Basics	
Instructor	Zubair Khalid
Room No.	9-251 (Zubair)
Office Hours	TBA
Email	zubair.khalid@lums.edu.pk
Telephone	8477
Secretary/TA	TBA
TA Office Hours	TBA
Course URL (if any)	https://lms.lums.edu.pk/

Credit Hours	3			
Lecture(s)	Nbr of Lec(s) Per Week	2	Duration	75 minutes

Course Distribution	
Core	EE-MS
Elective	May be Elective for others
Open for Student Category	BS (Needs prior permission) / MS / PhD

COURSE PREREQUISITE(S)	
•	Required: Linear Algebra
•	Recommended: Introduction to Analysis, Signal Processing, Feedback Control Systems

Grading Breakup and Policy (Tentative)
Homework Assignment(s): 25% (5 Assignments) Quiz(s): 10% (3-5 Quizzes) 2 Midterm Examination:40% Final Examination:25%

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Course Objectives
By the end of the course, the students should be able to • understand the basic theory of convex optimization. • recognize and formulate the convex optimization problems appear in a variety of applications. • analyze a convex problem using convex optimization theory and duality theory. • solve optimization problems by using different state-of-the-art algorithms. • use the tools/methods learnt in this course in their own research work and applications.

Examination Detail (Tentative)	
Midterm Exams	Duration: 2 hours Preferred Date: Week 6, Week 11 Exam Specifications: Closed book closed notes/Calculators Allowed
Final Exam	Yes/No: Yes Duration: 3 hours Exam Specifications: Closed book, closed notes/Calculators Allowed/

Textbook(s)/Supplementary Readings
Text: • Boyd, Stephen, and Lieven Vanderberghe. **Convex Optimization**. Cambridge University Press, 2004 References: • Bertsekas, Dimitri. **Convex Optimization Theory**. Athena Scientific, 2009 • Ben-Tal and Nemirovski. **Lectures on Modern Convex Optimization: Analysis, Algorithms, and Engineering Applications**, SIAM Series, 2001. • Nesterov. **Introductory Lectures on Convex Optimization: A Basic Course**. Springer, 2003. • David G. Luenberger, **Optimization by Vector Space Methods**, Wiley, 1997. • R. Tyrell Rockafellar, **Convex Analysis**, Princeton University Press., 1996