



Course: Tropical Geometry and Economy

Status: Complementary

Hours: 30 HS

Credits: 2

OVERVIEW:

Tropical geometry appeared long ago and it has been a ubiquitous construction appearing in a multitude of areas including economy. The aim of this course is to provide some basic background of tropical geometry in order to prepare the student to understand some of the central ideas underlying recent papers which use tropical geometry techniques to describe problems relevant to economy, such as, the analysis of the demand and mechanism design.

Prerequisite: Basic Calculus

PROGRAM CONTENT:

I. BASICS OF TROPICAL GEOMETRY

François Baccelli, Guy Cohen, Geert Jan Olsder, and Jean-Pierre Quadrat, Synchronization and linearity: an algebra for discrete event systems, John Wiley & Sons Ltd, 1992.

Peter Butkovic, Max-linear Systems: Theory and Algorithms, Springer Monographs in Mathematics, 2010.

Raymond A. Cuninghame-Green, Minimax Algebra, Lecture Notes in Economics and Mathematical Systems, Springer-Verlag, 1979.

Diane Maclagan and Bernd Sturmfels, Introduction to Tropical Geometry, Graduate Studies in Mathematics, American Mathematical Society, 2015.

II. TROPICAL GEOMETRY TO ANALYZE DEMAND

Elizabeth Baldwin and Paul Klempner, “Understanding preferences: ‘demand types’, and the existence of equilibrium with indivisibilities”, Technical report, The London School of Economics and Political Science, 2016.

Elizabeth Baldwin and Paul Klempner, “Tropical Geometry to Analyse Demand”, Working paper, Oxford University, 2012.

Ngoc Mai Tran and Josephine Yu, “Product-mix auctions and tropical geometry”, 2015, available at arXiv:1505.05737.



III. TROPICAL GEOMETRY AND MECHANISM DESIGN

Robert Alexander Crowell and Ngoc Mai Tran, “Tropical geometry and mechanism design”, 2016, available at arxiv:1606.04880.

Rakesh V. Vohra, Mechanism Design: A Linear Programming Approach, Econometric Society Monographs, Cambridge University Press, 2011.

Grading:

First midterm exam covering topic I (25%);

Second midterm exam covering topics related to II and III (25%);

Oral presentation on topics related to I, II or III connected with economy (25%);

Weekly homework assignments (25%)