YALE UNIVERSITY
SYLLABUS
FALL 2026, ECON 4433

THE ECONOMICS OF SPACE

General Information

Instructor: Professor Costas Arkolakis
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Phone: 203 432 3527, Email: costas.arkolakis@yale.edu
Class Webpage: www.theeconomicsofspace.com, Research: www.econ.yale.edu/~ka265
Office Hours: Mon 14:30-15:30 & by apt.
Lecture: Mon and Weds, 11:35 – 12:50, location WLH113.

Teaching Fellow: Winston Chen. Email: winston.chen@yale.edu
Office Hours: TBA. TF section: TBA.

Course Description

How do economic fundamentals and innovations in transportation and communication methods affect the allocation of economic activity across locations? This course will develop the required tools to understand how space shapes economic activity and leads to regional disparities in income and population. We will model space as a network of links and use basic mathematics from the analysis of networks and linear algebra to characterize the endogenous allocation of production and economic agents across space. Using this framework, we will then discuss how geospatial data can be analyzed using GIS software to understand the impact of innovations in transportation and communication on shaping economic activity across space. Finally, we will discuss frontier research in spatial economics pertaining to the effects of agglomeration forces, amenities, infrastructure investment, the formation of cities and their importance as a driver of growth, and the historical aspects of American Urbanization. In this last part of the course, we discuss the artificial intelligence and big data revolution and its impact in spatial economics research.

Course Structure

The course is designed to train students in the use of data and models to analyze the impact of space in economic activity. We will start with a detailed accounting of data sources for spatial data for income, population and geocoded information. The instructor and TF of the course will teach students how to use this information together with GIS software. The course then will proceed in analyzing a geographical network and solutions to the optimal routing problem. Finally, the course will build and analyze an appropriate theoretical framework for understanding the impact of space in economic activity in a context with agglomeration forces, amenities and costs of moving goods across space. Basic linear algebra techniques for analyzing this framework will be discussed. The final part of this course will discuss how this model can be used to plan optimal infrastructure policies, conduct optimal city design, and analyze the role of spatial policies on economic growth with the use of big data.

Background
The prerequisite for this class is Multivariate Calculus (118 or 120) or Instructor's consent. The course is open to graduate students who will be graded on a different curve and with a different midterm and final exam.

Notes for the class
There will be no official textbook for this class. Material for the class is posted on the class website. We will also cover several papers as indicated in the tentative class schedule below. Relevant class material will be uploaded on the class website.

Other useful textbooks
A. O'Sullivan, Urban Economics, 8th edition, McGraw and Hill.
J. K. Brueckner, Lectures on Urban Economics, MIT Press,
E. Glaeser, Cities, Agglomeration and Spatial Equilibrium, Oxford Univ. Press (advanced)
M. Fujita, P. Krugman, A. J. Venables, The Spatial Economy, MIT Press (very advanced)

Class Web Page and email contact.
I will post almost all class material on the class website www.theeconomicsofspace.com. Homework material and solutions will be posted on canvas. You can also email me at costas.arkolakis@yale.edu *provided that* you put in the subject of the email "ECON 433".

Midterm exam, final exam, and problem sets. In the midterm, final exam, and problem sets, students must illustrate that they have comprehended the class material. You are supposed to hand in your independent work. There will be additional questions in the problem sets and exams for Master's students. Violations of academic integrity are taken seriously. The midterm is on **Mon October 19th** during class time. Final exam is on **Tue December 15h**.

Grading Criteria:
The weights for the final grade will be as follows:

Final:	35%
Class Participation	10%
3 Problem Sets	10% each
Midterm	25%

Academic Integrity
Fundamental to the academic work you do at Yale is an expectation that you will make choices that reflect integrity and responsible behavior. Honesty is the foundation of good academic work. Do trust the value of your own intellect and credit others for their work. Do not copy ideas or phrases without citing them appropriately. Do not submit projects or papers that have been written for a previous class. See https://poorvucenter.yale.edu/writing/using-sources/understanding-and-avoiding-plagiarism. Please note that collaboration is actively encouraged, and indeed is also fundamental to academic and professional work. You should be engaged in conversations with your classmates on the material. However, the key is to always appropriately credit others and cite collaboration (in particular, for your homework).

Guest Lectures
There will be guest lectures that will be part of the regular class. Visitors will be people with years-long experience in research in spatial economics. The dates of these lectures will be announced in class.

Tentative Course Schedule

Date	Lecture
Week 1	Spatial Facts and Basic Elements
Week 2	A Brief History of Space in Economics/HW1 assigned
Week 3	Production and Agglomeration Economies/Amenities and Consumption
Week 4	*A Basic Equilibrium Model with Density: Supply and Demand Across Locations*
Week 5	Modeling Space and the Network of Locations/HW1 due
Week 6	Solving for Spatial Equilibria/HW2 assigned
Week 7	Routing Problem in Transportation and Traffic Congestion/ Use of GIS software
Week 8	*Reducing Remoteness: Effects of Transportation Infrastructure Investment*
Week 9	Spatial Mobility Frictions/HW2 due
Week 10	*Migration, Urbanization, and Spatial Inequality*/ HW3 assigned
Week 11	Spatial Economy and Environmental Externalities
Week 12	*Benefits of Environmental Protection and Clean Technologies*/ HW3 due
Week 13	Topics: AI, Big Data and Spatial Economics/ Review of Material