

**UNIVERSITY OF ARKANSAS
DEPARTMENT OF CIVIL ENGINEERING**

**CVEG 5413 TRANSPORTATION AND LAND DEVELOPMENT
Fall 2022**

Instructor: Dr. Suman Kumar Mitra, Assistant Professor
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Office Hours: Tuesdays (10.30 am-11.30 am), or by appointment.

Lectures: Tu Th 3:30 PM-4:45 PM, ENGR 0304.

Course Description :

This course will provide students with insight into the fundamentals of the relationship between transportation and land use and how this relationship influences the development of metropolitan areas in the US and around the world. This course is divided into four parts. First, it will start with a foundational review of theories and research about the complex relationships among transportation, land use, and urban form, moving on to introduce the related issues of individual and firm travel demand. Building on these foundations, in the second part of the course, students will explore the influence of land use and urban form on travel behavior, including historical interest and evidence, relevant theories and analytical approaches, techniques for measuring relevant aspects of urban form, and implications for planning tools and policymaking. The third part of the course presents analysis methods for the various components of the activity system, of which transportation is a single, albeit crucial subsystem - that which ties the region together in both a spatial and a functional sense. The key sub-systems which form the focus of this course are transportation, land use, population, economics, and activity location. A variety of the analytical techniques presented are useful in alternate applications; however, each technique is introduced in the context of the sub-field where it is most utilized. Finally, the fourth part of the course will take a prospective perspective, looking at the implications of the land use-transportation interaction space for metropolitan futures and our abilities to forecast them.

Course Learning Outcomes:

By the end of the course, students should have developed:

- An understanding of transportation-land use interaction theories
- An ability to interpret analyses of the influence of land use on travel behavior.
- Skills for measuring urban form and design from the perspective of travel behavior research.
- An understanding of the impacts of transportation infrastructure on land development and land value.
- A knowledge of the various relevant land use-transportation interaction models.

Grading Criteria:

Item	Percentage
Homework	40%
Term Project	25%
Final Exam	30%
Participation in Class and Discussion	5%

Term Project:

The students will work as a group in the term project (4 to 5 students in each group). The students will perform an **Experiential Simulation Exercise**. The task of the simulation exercise is to redesign Dickson Street, Fayetteville- “The Complete Dickson Street Project.” It should be a comprehensive street upgrade project that will consider a holistic picture of transportation and land-use interaction as well as social equity issues. There will be two presentations on the project. The first one is on the 7th week of the semester, and the final presentation is on the 13th week. Each group has to submit a final report on the simulation exercise output, which is due on the final week of the class. More information on the simulation exercise will be provided in the class.

Textbooks and References:**1. General References**

- a. Hanson, S. & Giuliano, G. (2004). *The Geography of Urban Transportation*. New York, NY: The Guilford Press.
- b. Rodrigue, J-P et al. (2017) *The Geography of Transportation systems*, Fifth Edition. <https://transportgeography.org/>
- c. M. Fujita (1989) *Urban Economic Theory, Land Use, and City Size*
- d. Regional Science Web Book
<http://www.rri.wvu.edu/WebBook/Briassoulis/contents.htm>
- e. Angie Schmitt (2020). *Right of Way*. Island Press
- f. *Sharing Cities: A Case for Truly Smart and Sustainable Cities*
- g. *Right of Way: Race, Class and the Silent Epidemic of Pedestrian Deaths in America*

2. Spatial Econometrics

- a. *Econometrics toolbox*: by James P. LeSage.
<https://www.spatial-econometrics.com/>
- b. Fischer, M. M., & Wang, J. (2011). *Spatial data analysis: models, methods and techniques*. Springer Science & Business Media.
- c. Anselin, L., & Bera, A. K. (1998). Introduction to spatial econometrics. *Handbook of applied economic statistics*, 237.

3. Demographic Models

- a. A. Rogers (1985) *Regional Population Projection Models*
- b. R. Klosterman (1990) *Community Analysis and Planning Techniques*
- c. D. Pittenger (1976) *Projecting State and Local Populations*

- d. A. Rogers (1970) Matrix Methods in Urban and Regional Analysis
- e. S. Smith, J. Tayman, and D. Swanson (2001) State and Local Population Projections: Methodology and Analysis.
- f. W. Clark (1986) Human Migration
- 4. **Economic Analysis Models**
 - a. G. Hewings (1985) Regional Input-Output Analysis
 - b. R. Klosterman (1990) Community Analysis and Planning Techniques
 - c. W. Schaffer (1999) <http://www.rri.wvu.edu/WebBook/Schaffer/regionalGT.pdf>
- 5. **Land Use Models**
 - a. K. Haynes and A. Fotheringham (1984) Gravity and Spatial Interaction Models
 - b. G. Thall (1987) Land Use and Urban Form
 - c. D. Foot (1981) Operational Urban Models
 - d. AG Wilson (1974) Urban & Regional Models in Geography and Planning
 - e. B. Reif (1976) Models in Urban and Regional Planning
 - f. L. King (1984) Central Place Theory
 - g. M. Webber (1984) Industrial Location
 - h. C. Werner (1985) Spatial Transportation Modeling
- 6. **Transportation / Land Use**
 - a. S. Putman (1983) Integrated Urban Models
 - b. D. Foot (1981) Operational Urban Models
 - c. AG Wilson (1974) Urban & Regional Models in Geography and Planning
 - d. B. Reif (1976) Models in Urban and Regional Planning
 - e. A. Anas (1982) Residential Location Markets and Urban Transportation
 - f. M. Batty (1976) Urban Modeling: Algorithms, Calibrations, Predictions
 - g. UrbanSim <https://urbansim.com>
 - h. MUSSA <https://journals.sagepub.com/doi/pdf/10.1177/0361198196155200118>
 - i. LILT <https://trl.co.uk/reports/SR805>
 - j. ILUTE <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.466.5891&rep=repl&type=pdf>
 - k. TRANUS <http://www.tranus.com/tranus-english>
 - l. MEPLAN <http://www.des.ucdavis.edu/faculty/johnston/pub5.htm>
 - m. EMPACT Project <http://empact.nhlink.net/docs/urban.html>
 - n. PECAS Model: <https://documents.atlantaregional.com/The-Atlanta-Region-s-Plan/RTP/remi-pecas/Mainto2014-V1-ARC-PECAS-Model-Development.pdf>
- 7. **Facility Location**
 - a. G. Rushton (1979) Optimal Location of Facilities
 - b. Wesolowsky, GO (1993) The Weber Problem: History and Procedures, Location Science, 1, 5-
 - c. RF. Love, JG. Morris, & GO. Wesolowsky (1988) Facilities Location: Models and Methods
 - d. GY Handler & PB Mirchandani (1979) Location in Networks: Theory and Algorithms
 - e. J-F Thisse & HG Zoller, eds. (1983) Location Analysis of Public Facilities
 - f. Larson, RC and Odoni, AR (1981) Urban Operations Research

These textbooks and monographs will be supplemented with a variety of articles and reports, (e.g.):

- Giuliano, G. (1995). The Weakening Transportation-Land Use Connection. *Access Magazine*, 1(6);
- Cervero, R., & Kockelman, K. (1997). Travel Demand and the 3Ds: Density, Diversity, and Design. *Transportation Research Part D: Transport and Environment*, 2(3), 199-219;
- Ewing, R., & Cervero, R. (2010). Travel and The Built Environment: A Meta-Analysis. *Journal of the American planning association*, 76(3), 265-294;
- Todd Litman. 2014. "Land Use Impacts on Transport: How Land Use Factors Affect Travel Behavior." Victoria Transport Policy Institute.
- Stevens, M. R. (2017). Does Compact Development Make People Drive Less? *Journal of the American Planning Association*, 83(1), 7-18. etc.
- Yoder, M. S. The Sprawling of Small Cities of Arkansas: The Case for Sustainable Urban Planning, *The Arkansas Journal of Social Change and Public Service*.

Tentative Course Outline (It may be modified as the semester progresses):

Topic 1. Introduction and Basic Concepts

- Transportation, Land Use and Urban Form
- Social Equity in Transportation

Topic 2. The Impact of Land Use on Transportation

- Accessibility vs Mobility: The Land Use-Transportation Link
- Urban Form and Travel Behavior
- Urban Form, Transportation, and Safety
- Measuring Urban Form and Urban Design
- Modeling the Impact of Land Use on Transportation

Topic 3. Influence of Transportation on Land Use

- Transportation Investment, Land Use, and Land Value
- Hedonic Price Modeling
- Spatial Modeling

Topic 4. Land Use-Transportation Models

- Land Use Models
- Demographic Models and Economic Models
- Integrated Land Use-Transportation Models