

Transportation Systems & Operations

Course Description:

This course provides an overview of the major modes of transportation and how they work together to form the transportation system. The financial and regulatory components of the transportation system will be introduced. Students will examine the impact of the transportation system and modes on local, national, and global economies, public systems, and the environment. The course will highlight public and private job opportunities in transportation and the skills needed for career development.

Essential Objectives:

- 1) Define transportation and the distinction between mobility and access.
- 2) Identify and explain the major modes of transportation, including how the modes work together as a system.
- 3) Identify the main sources of state and federal transportation funding and how roles are delegated among public and private entities.
- 4) Understand the regulatory aspects of transportation at the federal, state, and local levels.
- 5) Describe the economic impact of transportation on individuals, businesses, and communities and analyze the varying needs, benefits and effects of each transportation mode.
- 6) Discuss the environmental impacts of the transportation modes and methods to incorporate sustainability into the transportation system.
- 7) Discuss the social impacts of transportation system choices.
- 8) Analyze key transportation issues and challenges in a rural state.
- 9) Understand and identify potential career opportunities within each mode and the option for “green jobs” within the transportation field.
- 10) Identify the skills needed for careers in each mode and understand methods to achieve future career development.

Methods:

Students will be introduced to a mix of statistical data, narrative explanations, and on-the-ground experiences to develop a thorough understanding of the transportation system.

- 1) Read the assigned text, reports, and articles. (Goal is to provide background data and statistics at the national and state levels)
- 2) Complete short writing assignments to integrate reading materials into real world situations. (Goal is for students to connect the transportation system to their lives and local communities)
- 3) Complete three field assignments:

- a. Complete one site visit to a transportation operations center (any mode) and a corresponding reflective writing paper. (Goal is to experience the operations and implementation aspect of the transportation industry)
 - b. Attend at least one administrative or public meeting where transportation is discussed (any second mode) and prepare a corresponding reflective writing paper. (Goal is to experience the administrative side of the transportation industry)
 - c. Interview one individual working in the transportation field and create a “career pathway” summary. (Goal is to have the student explore the career path of a particular individual and get a better sense of the skills needed for the particular position. The interview process will also offer an opportunity for student to practice interacting professionally with individuals in the transportation field)
- 4) Two or three short quizzes
 - 5) Midterm and Final Research Papers

Evaluation Criteria:

- 1) Short Writing Assignments related to reading/class materials (20%/20 points)
- 2) Field Assignments (30%/30 points)
- 3) Short Quizzes (20%/20 points)
- 4) Research Paper, including oral presentation (30%/30 points)

Grading Criteria:

A+ through A- (100-90): To receive a grade in the “A” range, a student will be expected to complete all assignments at an excellent level and demonstrate a comprehensive understanding of the subject matter. Students will be expected to think critically about the materials presented and consistently offer their own analysis of the topics discussed. Frequent participation without prompting will be expected. A grade in this range represents a high level of mastery of the subject matter.

B+ through B- (89-80): To receive a grade in the “B” range, a student must fully complete all assignments and do so with good quality. Students must demonstrate some independent analysis of the materials presented and contribute to class discussions. A grade in this range represents full understanding of the subject matter with mastery of some elements.

C+ through C- (79-70): A grade in the “C” range will be the result of meeting the minimum requirements of the course assignments. Students must complete assignments and participate enough to demonstrate comprehension of the materials presented.

D+ through D- (69-60): A grade in the “D” range will be the result of falling short of the minimum expectations and requirements for some assignments while demonstrating comprehension of others. Students who can sometimes but not always fully articulate their understanding of the course materials will receive a grade in this range.

F (below 60): An “F” grade represents work that falls short of the minimum course expectations in all instances. Incomplete assignments and the inability to demonstrate any significant comprehension of the course material will result in an “F.”

Attendance Policy: Attendance at and participation in all classroom sessions is essential to the successful completion of this course. More than two absences without prior discussion with the instructor will negatively impact your grade.

Week by Week Syllabus

Reading Assignments to Complete Prior to the First Class:

- *A Guide to Transportation* – Pages 1-21
- *Evaluating Accessibility for Transportation Planning* – Pages 2-4

Week 1:

- E.O. #1 - Define transportation and the distinction between mobility and access.
- Students will be introduced to the concept of transportation, not only as a network of physical movement, but also as means of sharing information.
- Week 1 Reading:
 - *A Guide to Transportation* – Pages 33-78, 89-105, and 113-141
 - *Transmissions Pipelines and Land Use* – Pages vii and 1-2
 - *Guidelines for Ferry Transportation Services* – Pages 9-10
 - *General Aviation Airports: A National Asset* – Pages 1-10
 - *Amtrak: Fiscal Year 2012*- Pages 1-10
 - *US DOT/RITA Pocket Guide to Transportation 2012* – Pages 10-29
 - *Transportation Geography and Network Science/Telecommunications Networks and Travel Behavior* -
http://en.wikibooks.org/wiki/Transportation_Geography_and_Network_Science/Telecommunications_networks_and_travel_behavior#Relationships_between_telecommunication_and_transportation

Weeks 2 & 3: E.O. #2 - Identify and explain the major modes of transportation, including how the modes work together as a system.

- Week 2:
 - Each of the major modes of transportation will be defined and explained
 - Land vs. Air vs. Water
 - Passenger vs. Freight (current mode shares for each will be presented)
 - Other Modes – telecommunications, pipelines, human-powered/active transportation
 - Major milestones and developments within the transportation system will be identified.
 - Week 2 Reading:
 - *Impacts of Public Policy on the Freight Transportation System* – Chapter 2
 - *Making Connections: Intermodal Links in the Public Transportation System*
 - *U.S. Freight on the Move: Highlights from the 2007 Commodity Flow Survey Preliminary Data* - By Michael Margreta, Chester Ford, and M. Adhi Dipo
 - *Multimodal Freight Transportation Within the Great Lakes–Saint Lawrence Basin* – Page 48, Figure 3-37
 - Week 2 Assignment: Review the “facilities” maps and record three observations about the geography/size of the US transportation system (1 page max). Assignment ideas: How is the expanse and geography of the transportation system different that you expected? Can you relate the system to an experience you have had?

- Week 3:
 - The ideas of multi-modalism and inter-modalism will be discussed.
 - The inter-dependence and connection of the modes within the transportation system will be highlighted.
 - The geographic expanse of transportation will be discussed
 - Week 3 Reading:
 - *US DOT Budget Highlights 2013 – Page 2*
 - *Vermont FY2011 Transportation Program Summary*
 - *Using Public Private Partnerships to Carry Out Highway Projects – Chapter 1*
 - *Alternative Approaches to Funding Highways*
 - Week 3 Assignment: List three modes of transportation that impact your life and explain 1) the importance of each mode to you personally and 2) how the modes do or do not interact effectively (2 pages max).

Weeks 4 & 5: E.O. #3 - Identify the main sources of state and federal transportation funding and how roles are delegated among public and private entities.

- Week 4:
 - Public vs. Private Transportation
 - The main funding streams for public investment in transportation will be discussed.
 - Federal Budget/Federal Transportation Bill
 - State Budget
 - Other sources of funding; innovative financing, private funding, public/private partnerships
 - Quiz #1 – Topic will be the transportation modes
 - Week 4 Reading:
 - MAP-21 Summary
 - *Vermont Transportation Funding Options – Executive Summary*
 - Week 4 Field Assignment (due in Week 5): Attend a local or statewide meeting about transportation and write a 1-page reflective paper about the experience, including issue(s) discussed, parties involved, and resolution/next steps). Meeting options include Regional Planning Commission meetings, VT Senate or House Transportation Committee meetings, public transit Board meetings, VTTrans project-specific public meetings.
- Week 5:
 - Key challenges in transportation funding will be discussed
 - Federal Transportation Trust Fund depletion
 - Projected Vermont transportation deficit
 - Idea of life cycle costs
 - Video: The Important Difference Between a Road and a Street - <http://www.strongtowns.org/videos/>
 - Week 5 Reading:
 - *US DOT Budget Highlights 2013 – Pages 24, 27, 31, 34, 38, 41, 44, and 51*
 - *US DOT Agency Financial Report 2012 – Pages 10-15*
 - *US DOT/RITA Pocket Guide to Transportation 2012 – Pages 1-9*

- *Transportation 101 Executive Summary*
- *The Business Case for Investment in Public Transportation*
- Week 5 Assignment: Select a topic for your research paper. Choose from one of the following or propose your own (with approval from instructor):
 - 1) How will the transportation system be different in the future?
 - 2) Transportation and the Environment
 - 3) Transportation and the Economy
 - 4) Develop your own

Week 6: E.O. #4 - Understand the regulatory aspects of transportation at the federal, state, and local levels.

- Regulatory parties for each mode will be identified and the connection to funding will be discussed:
 - Federal
 - State
 - Local
- Increasing focus on safety and security regulations
- Week 6 Reading:
 - *The Transportation Challenge: Moving the US Economy* – Pages 4-70
 - *Economic Impact of Public Transportation Investment* - Summary
- Week 6 Assignment: One page paper on what change in the transportation system you believe would have the most immediate or serious impact on your community.

Weeks 7 and 8: E.O. #5 - Describe the economic impact of transportation on individuals, businesses, and communities and analyze the varying needs, benefits and effects of each transportation mode.

- Week 7
 - Study the magnitude of freight and the number of people transported each day by the various modes.
 - Review and analyze economic impact studies
 - Transportation as a key component of all economic activity
 - Transportation sector as a key employment generator
 - Video – Transportation and Economic Opportunity - http://t4america.org/audio/webinars/052909_economy/lib/playback.html
 - Week 7 Reading:
 - *Methodologies to Estimate the Economic Impact of the Disruption of the Goods Movement System* – Chapter 4
 - Week 7 Assignment: One page outline of research paper, including general topic, your specific research question, types of data to be used in your analysis.
- Week 8
 - Review case studies of past transportation system breakdowns and their economic impact
 - Consider future issues in transportation that could have an economic impact
 - Fuel availability/New fuels
 - Technology improvements
 - Week 8 Reading:

- *Climate Change and Transportation* – Whole Document
 - *Adapting Transportation to the Impacts of Climate Change* – Whole Document
- Week 8 Assignment: Turn in first five pages of research paper for review and discussion on one-on-one basis next week

Weeks 9 & 10: E.O. #6 - Discuss the environmental impacts of the transportation modes, the impact of climate change on the transportation system, and methods to incorporate sustainability into the transportation system.

- Week 9
 - Study how the transportation system contributes to GHG emissions and other environmental challenges
 - Study how climate change is impacting the transportation system
 - Damage from storms
 - Vermont Case Study – Tropical Storm Irene
 - National Case Study – Hurricane Sandy
 - Concept of resiliency planning
 - Week 9 Reading:
 - *Vermont Comprehensive Energy Plan* – Chapter 9
 - *Best Practices in Transportation Demand Management* – Whole Document
 - Week 9 Assignment: Submit name and agency of transportation professional you intend to interview within next two weeks AND three questions you plan to ask.
- Week 10
 - Transportation Sustainability Initiatives
 - Travel Demand Management
 - Transportation System Management/ITS
 - Connection of transportation to broad-based energy efficiency initiatives (Vermont Comprehensive Energy Plan)
 - Week 10 Reading:
 - *Transportation Cost and Benefit Analysis* – Executive Summary
 - *The Future Isn't What It Used to Be* – Whole Document
 - Week 10 Assignment: One page paper on three initiatives you believe would be effective in reducing travel demand in your community.

Week 11: E.O. #7 - Discuss the social impacts of transportation system choices.

- Discuss the various users of the transportation system and how they are affected by system decisions and investments
 - Low Income/Economic opportunity
 - Persons with disabilities/ADA
 - Seniors/Aging in Place
- Health impacts of transportation choices and investments
- Week 11 Reading:
 - *Transporting the Public* – Data Report and Final Report
 - *Vermont Long Range Transportation Business Plan*
 - Executive Summary
 - Full Report Chapter 3
- Week 11 Assignment: Turn in one page summary of interview with transportation professional.

Week 12: E.O. #8 - Analyze key transportation issues and challenges in a rural state.

- Discuss the impact of rural land use patterns and lower development density
- Explain the impacts of Vermont's high per capita VMT
- Review the funding limitations due to smaller tax base as compared to larger, more urban states
- Week 12 Assignment: Research paper due in Week 13

Week 13: E.O. # 9 - Understand and identify potential career opportunities within each mode and the option for "green jobs" within the transportation field.

- Review each mode and discuss common job opportunities within each
- Identify less obvious job opportunities within the transportation industry, including "green" opportunities.
- Week 13 Assignment: Prepare 5-minute oral presentation about your research paper to be given in class in Week 14

Week 14: E.O. #10 - Identify the skills needed for careers in each mode and understand methods to achieve future career development.

- Review the "Career Pathways" developed by the UVM TRC
- Students will be asked to share the "career pathway" summaries they created based on interviews
- <http://www.bls.gov/ooh/transportation-and-material-moving/home.htm>
- Week 14 Assignment: Develop your own "career pathway" based on what you learned from you interview, other career pathways, and interest in a particular transportation field

Week 15: Putting it all together

- Student presentations on the subject of their midterm and final research papers.
- Instructor will lead a discussion of common themes throughout the transportation system based on student presentations.

Textbook(s) and Materials:

Textbook

- Dawkins, Stella (2012). *A Guide to Transportation: An Overview, Different Modes of Transportation, Sustainable Transport, The Environment, etc.* http://www.amazon.com/Guide-Transportation-Different-Sustainable-Environment/dp/1241640254/ref=sr_1_1?ie=UTF8&qid=1353787671&sr=8-1&keywords=A+Guide+to+Transportation%3A+An+Overview%2C+Different+Modes+of+Transportation%2C+Sustainable+Transport%2C+The+Environment%2C+etc#

Other Materials

- *Climate Change and Transportation* (2012), Transportation Research Board <http://onlinepubs.trb.org/onlinepubs/circulars/ec164.pdf>
- *Adapting Transportation to the Impacts of Climate Change* (2011). Transportation Research Board. <http://onlinepubs.trb.org/onlinepubs/circulars/ec152.pdf>

- *Guidelines for Ferry Transportation Services* (2012), Transportation Research Board. http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_rpt_152.pdf
- *Transmission Pipelines and Land Use* (2012), Transportation Research Board. <http://onlinepubs.trb.org/onlinepubs/sr/sr281.pdf>
- *Multi-Modal Freight Transportation with the Great Lakes and St. Lawrence Basin* (2012), Transportation Research Board. http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_017.pdf
- *Impacts of Public Policy on the Freight Transportation System* (2011) Transportation Research Board. http://onlinepubs.trb.org/onlinepubs/ncfrp/ncfrp_rpt_006.pdf
- *Comprehensive Energy Plan* (2011), Vermont Public Service Department. http://publicservicedept.vermont.gov/publications/energy_plan/2011_plan
- Litman, Todd (2012). *Evaluating Accessibility for Transportation Planning*. <http://www.vtpi.org/access.pdf>
- Litman, Todd (2011). *A New Social Equity Agenda for Sustainable Transportation* <http://www.vtpi.org/equityagenda.pdf>
- Litman, Todd (2012). *The Future Isn't What It Used to Be* <http://www.vtpi.org/future.pdf>
- Litman, Todd (2011). *Transportation Cost and Benefit Analysis*. <http://www.vtpi.org/tca/>
- *Agency Financial Report, Fiscal Year 2012*, US Department of Transportation. http://www.dot.gov/sites/dot.dev/files/docs/dot_agency_financial_report_fy2012.pdf
- *Budget Highlights, Fiscal Year 2013*, US Department of Transportation. http://www.dot.gov/sites/dot.dev/files/docs/dot_budget_highlights_fy_2013_5MB.pdf
- *Destination 2025* (2012), Federal Aviation Administration. http://www.faa.gov/about/plans_reports/media/Destination2025.pdf
- *FAA Flight Plan, 2009-2013*, Federal Aviation Administration. http://www.faa.gov/about/plans_reports/media/flight_plan_2009-2013.pdf
- *FAA's Fiscal Year 2011: Summary of Performance and Financial Information*, Federal Aviation Administration. http://www.faa.gov/about/plans_reports/media/FAA2011PAR.pdf
- *Pocket Guide to Transportation* (2012). US Department of Transportation. http://www.bts.gov/publications/pocket_guide_to_transportation/2012/pdf/entire.pdf
- *The Case for Business Investment in Public Transportation*, American Public Transportation Association. http://www.bts.gov/publications/pocket_guide_to_transportation/2012/pdf/entire.pdf
- *Transportation Geography and Network Science/Telecommunications Networks and Travel Behavior* - http://en.wikibooks.org/wiki/Transportation_Geography_and_Network_Science/Telecommunications_networks_and_travel_behavior#Relationships_between_telecommunication_and_transportation
- *Making Connections: Intermodal Links in the Public Transportation* By Bruce Goldberg - http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/special_reports_and_issue_briefs/special_report/2007_09_18/pdf/entire.pdf
- *U.S. Freight on the Move: Highlights from the 2007 Commodity Flow Survey Preliminary Data* - By Michael Margreta, Chester Ford, and M. Adhi Dipo - http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/special_reports_and_issue_briefs/special_report/2009_09_30/pdf/entire.pdf
- *General Aviation Airports: A National Asset* - http://www.faa.gov/airports/planning_capacity/qa_study/media/2012assetreport.pdf

- *Vermont Transportation Funding Options* - <http://www.aot.state.vt.us/Documents/Sec%2040%20Funding%20Study%20-%20Final%20Legislative%20Report%20Jan%208%202013.pdf>
- *Using Public-Private Partnerships to Carry Out Highway Projects* - <http://www.cbo.gov/sites/default/files/cbofiles/attachments/01-09-PublicPrivatePartnerships.pdf>
- *Alternative Approaches to Funding Highways* - <http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/121xx/doc12101/03-23-highwayfunding.pdf>
- *Amtrak: Fiscal Year 2012 Budget and Comprehensive Business Plan* - <http://www.amtrak.com/ccurl/963/948/AmtrakFY12ComprehensiveBusinessPlan-FINAL-wAppx.pdf>
- *MAP-21 Summary* - http://www.fhwa.dot.gov/map21/docs/map21_summary_hgwy_provisions.pdf
- *Transportation 101* - <http://t4america.org/docs/Transportation%20101%20SUMMARY.pdf>
- *Methodologies to Estimate the Economic Impact of Disruptions to the Goods Movement System* - http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_732.pdf
- *Economic Impacts of Public Transportation* - http://www.apta.com/resources/reportsandpublications/documents/economic_impact_of_public_transportation_investment.pdf
- *The Transportation Challenge: Moving the US Economy* - http://www.uschamber.com/sites/default/files/reports/0804trans_challenge.pdf
- *Best Practices in Transportation Demand Management* - <http://www.seattle.gov/transportation/docs/ump/07%20SEATTLE%20Best%20Practices%20in%20Transportation%20Demand%20Management.pdf>
- *Vermont Long Range Transportation Business Plan* - <http://www.blcp.org/assets/files/Final%20AARP%20Data%20Guide.pdf>