

**VILLANOVA UNIVERSITY**  
**CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT**  
**SUMMER 2015**

**CEE 8207 Design of Sustainable Transportation System**

**Course Outline**

- Instructors:** **Mr. Brett Fusco** ([brett.fusco@villanova.edu](mailto:brett.fusco@villanova.edu))  
*Sr. Transportation Planner, Delaware Valley Regional Planning Commission*
- Dr. Leslie McCarthy, P.E.** ([leslie.mccarthy@villanova.edu](mailto:leslie.mccarthy@villanova.edu))  
*Assistant Professor, CEE Department, Villanova University*
- Office Hours:** By appointment only, Location: Tolentine Hall Room 144
- Lecture Time:** Thursdays 6:00 – 9:30 pm, held in CEER building, Room 314
- Course Website:** Access via Blackboard (<http://elearning.villanova.edu>). You will need to login with your Villanova ID and password

**Course Description**

Overview of sustainable transportation infrastructure system design including definition of sustainability; environmental consequences and transportation systems; technology for transportation sustainability; green roads; sustainable transportation infrastructure design guidelines; context sensitive solutions; mass transit; livable cities & communities; infrastructure resiliency and climate change; and performance life assessments. Upon completion of this course, students will demonstrate understanding of the ideas, theories, and uses that frame the sustainable development and sustainable infrastructure system. <3 credits>

**Course Outcomes**

Students will learn to:

- Define sustainability in connection with transportation systems;
- Apply current sustainable transportation infrastructure design guidelines and practices to real-world applications;
- Analyze and evaluate sustainable transportation infrastructure design process and systems;
- Develop application of state-of-art technology to improve sustainability of transportation systems;
- Review various sustainable transportation system policies, initiatives, and projects;
- Consider the importance of building resiliency and flexibility into the system; and
- Understand how pricing and markets affect sustainability.

## Further Reading and Course References

- *Industrial Ecology and Sustainable Engineering*, T.E. Graedel and B. R. Allenby, Prentice Hall (2010)
- *The Theory and Practice of sustainable Engineering*, B. R. Allenby, Prentice Hall (2011)
- *An Introduction to Sustainable Transportation: Policy, Planning and Implementation*, Preston L. Schiller et al, Earthscan (2010)
- *Sustainable Transportation: Problems and Solutions*, William R. Black, Guilford Press (2010)
- National Cooperative Highway Research Program (NCHRP) Reports
- Other Handouts on *Sustainable Transportation, Sustainable Infrastructure* as appropriate.
- City Lab Future of Transportation series ([www.citylab.com/special-report/future-of-transportation/](http://www.citylab.com/special-report/future-of-transportation/))
- Victoria Transportation Planning Institute Transportation Demand Management website (<http://www.vtpi.org/tdm/index.php>)

**Evaluation of Students:**      Weekly Reading Reactions: 25%  
   Homework Assignments: 25%  
   Group Project: 30%  
   Project Presentation: 20%

**Grading Policy:** Numerical averages for specific letter grades\* are as follows:

<u>Numerical Average</u>	<u>Letter Grade</u>
92 – 100	A
89 – 91	A-
86 – 88	B+
82 – 86	B
80 – 82	B-
75 – 79	C+
71 – 74	C
0 – 70	F

## Course Policy:

1. Attendance in class is expected and necessary to successfully completing the course. If a conflict arises in which you cannot attend class, please notify the instructor in advance of the class meeting.
2. It is preferred that Distance Learning students attend the course “live” on the night of its delivery, to better engage in activities and to be able to ask questions. Some of the subjects to be covered in this course are complex and the software portion can generate numerable questions. *It is in the best interest of the DL student to view class as it is going on to ensure the best learning environment and opportunity for you.*
3. Homework assignments and projects are to be submitted at the beginning of class on their assigned due date.
4. The instructor will discuss any project or homework grade within 48 hours (excluding weekends and holidays) of their return, after which time the discussion is closed.

**Attendance Policy:** Students are expected to attend all lectures live (in person or on the Distance Learning portal). It should be noted by students that although the option exists to watch recorded lectures, the Instructors' preference is that you make every effort to attend/watch at the course time, in order to provide you with the most holistic learning experience.

**Academic Honesty:** All students admitted to Villanova University are subject to the statement of academic honesty committing them to be honest in all academic work and understanding that failure to comply with this commitment will result in disciplinary action. This statement is a reminder to uphold your obligation as a Villanova student and to be honest in all work submitted taken in this course, including not changing answers and seeking extra points after a graded assignment is handed back to you. In addition, this includes not sharing references or sources with each other when doing homework assignments period. If the Instructor suspects that academic dishonesty has taken place, the burden of proof is on the student and not on the Instructor. Violation will result in a "0" for the assignment and possible academic suspension by the Dean of the College of Engineering.  
<http://www1.villanova.edu/villanova/vpaa/studentservices/policies/integrity/integritypolicy.html>

**Students with disabilities:** Villanova University will make reasonable academic accommodation for qualified individuals with disabilities. If you are a person with a disability, please make arrangements to register with the Learning Support Office by contacting Mrs. Nancy Mott at 610-519-5636 or email [nancy.mott@villanova.edu](mailto:nancy.mott@villanova.edu) as soon as possible. Please setup an appointment with me to discuss specific accommodations for this course. Individual student policies cannot be made after 3 weeks into semester.

**Homework / Projects:** You will have individual homework assignments to turn in for this course, assigned at the discretion of the Instructors. *Individual homework is expected to reflect an independent effort; i.e., you cannot work with other students.*

**Reading Reactions:** Each week a series of readings have been assigned, which are essential for in class participation. For each assigned reading, you will need to prepare a 150 to 300 word response. Your response can summarize the article, talk about things that aren't clear to you, disagree with it, expand on it, or (preferred) talk about how the article connects with and/or relates to other things we have talked about in the class. Please post reading reactions to Blackboard by 5 pm on Thursday night before class.

## Course Schedule and Topics

Week	Date	Contents
Week 1	May 28 <sup>th</sup>	Introduction to Course The Context of Sustainability in Transportation System
Week 2	June 4 <sup>th</sup>	Conceptualizing Sustainable Transportation Systems <b>Homework #1 (In Class)</b>
Week 3	June 11 <sup>th</sup>	Context Sensitive Solutions
Week 4	June 18 <sup>th</sup>	Context Sensitive Solutions (Cont'd) and Congestion Pricing <b>Homework #2 Presentations</b>
Week 5	June 25 <sup>th</sup>	Livable Cities and Communities <b>Homework #3 Due</b>
Week 6	July 2 <sup>nd</sup>	Incorporating Sustainability into Transportation Infrastructure
Week 7	July 9 <sup>th</sup>	Transportation's Role in Moving North America's Energy Products Efficiently <b>Homework #4 Due</b>
Week 8	July 16 <sup>th</sup>	Mass Transit & Bicycle - Recorded session only (no in-class portion), access on Blackboard <a href="http://elearning.engineering.villanova.edu/Mediasite6/Catalog/Full/57002a92f0fd4992aa6b62346cd292fe21">http://elearning.engineering.villanova.edu/Mediasite6/Catalog/Full/57002a92f0fd4992aa6b62346cd292fe21</a>
Week 9	July 23 <sup>rd</sup>	Climate Change and Transportation System Resiliency <b>Homework #5 Due</b> <b>Group Project Presentations</b>
Week 10	July 27 <sup>th</sup>	<b>Group Project Due – please submit electronically to Blackboard by 5 p.m.</b>

\*\*\*Note: Course schedule subject to change

## Course Schedule and Topics

1. May 28: Course Intro

2. June 4: Conceptualizing Sustainable Transportation Systems

Reading Reactions Due by 5 p.m. June 4:

- NJDOT and PennDOT Smart Transportation Guidebook. Chapter 1. Pages 1-6.  
<http://www.dvrpc.org/reports/08030A.pdf>
- NJDOT and PennDOT Smart Transportation Guidebook. Chapter 2. Pages 7-20.  
<http://www.dvrpc.org/reports/08030A.pdf>
- Ian Lockwood. Livable Traffic Engineering. (Video, allow 1 hour to view):  
<https://www.youtube.com/watch?v=o7IXblXNOPk>

3. June 11: Context Sensitive Solutions

Reading Reactions due by 5 pm June 11:

- NJDOT and PennDOT Smart Transportation Guidebook. Chapters 3 and 4. Pages 21-26.  
<http://www.dvrpc.org/reports/08030A.pdf>
- NJDOT and PennDOT Smart Transportation Guidebook. Chapter 5. Pages 27-34.  
<http://www.dvrpc.org/reports/08030A.pdf>
- The Next Generation of Complete Streets is Unfolding in New Haven. CityLab:  
[www.citylab.com/cityfixer/2015/02/the-next-generation-of-complete-streets-is-unfolding-in-new-haven/385649/](http://www.citylab.com/cityfixer/2015/02/the-next-generation-of-complete-streets-is-unfolding-in-new-haven/385649/)
- Better Cities. Seeking A few Good Transportation Engineers: <http://bettercities.net/news-opinion/blogs/robert-steuteville/21381/seeking-more-few-good-transportation-engineers>

4. June 18: Context Sensitive Solutions and Congestion Pricing

Reading Reactions Due by 5 p.m. June 18:

- NJDOT and PennDOT Smart Transportation Guidebook. Chapter 6. Pages 35-44.  
<http://www.dvrpc.org/reports/08030A.pdf>
- NJDOT and PennDOT Smart Transportation Guidebook. Chapter 7. Pages 45-60.  
<http://www.dvrpc.org/reports/08030A.pdf>
- Congestion Pricing: A Primer. FHWA:  
<http://ops.fhwa.dot.gov/Publications/congestionpricing/congestionpricing.pdf>

5. June 25: Livable Cities and Communities

Reading Reactions Due by 5 p.m. June 25:

- Tactical Urbanism, Volume 1.  
[http://issuu.com/streetplanscollaborative/docs/tactical\\_urbanism\\_vol.1](http://issuu.com/streetplanscollaborative/docs/tactical_urbanism_vol.1)
- Shoup, Donald. *The High Cost of Free Parking*. Chapter 1: <http://shoup.bol.ucla.edu/Chapter1.pdf>
- A Primer for Traffic Safety Culture. Jay Otto and Jeff Linkenbach.  
[http://www.westerntransportationinstitute.org/documents/centers/chsc/ITEJMay\\_TrafficSafetyCulturePrimer\\_Ward\\_Otto\\_linkenbach.pdf](http://www.westerntransportationinstitute.org/documents/centers/chsc/ITEJMay_TrafficSafetyCulturePrimer_Ward_Otto_linkenbach.pdf)
- Paris to limit speed limits to 30 KM/HR over entire city. World Streets:  
<http://worldstreets.wordpress.com/2014/05/21/paris-to-limit-speeds-to-30-kmhr-over-entire-city/>

6. July 2: Incorporating Sustainability into Transportation Infrastructure

Reading Reactions Due by 5 p.m. July 2:

- U.S. PIRG. The Innovative Transportation Index.:  
[http://www.uspirg.org/sites/pirg/files/reports/Innovative\\_Transportation\\_Index\\_USPIRG.pdf](http://www.uspirg.org/sites/pirg/files/reports/Innovative_Transportation_Index_USPIRG.pdf)
- MIT News How to Make Big Things Out of Small Pieces: <http://newsoffice.mit.edu/2013/how-to-make-big-things-out-of-small-pieces-0815>
- TERRA E-news (April 2015 Vol. 9, No. 2). Durable Roads Program in Norway:  
<http://www.terraroadalliance.org/news/enews/2015/02/spotlight/index.html>

7. July 9: Transportation's Role in Moving North America's Energy Products Efficiently

Reading Reactions Due by 5 p.m. July 9:

- Movement of Crude Oil: <https://www.dot.ny.gov/programs/crudeoilreport> (Press Release, [EO125](#))
- Freight Shipments and the Roads that Carry Them:  
<http://www.terraroadalliance.org/news/enews/2015/02/conference/index.html>
- FHWA Public Roads article on Energy Development Impacts and Solutions (draft is downloadable on Blackboard)

8. July 16: Mass Transit and Bicycle (recorded session only)

Reading Reactions Due by 5 p.m. July 16th (EMAIL TO INSTRUCTOR):

- NJDOT and PennDOT Smart Transportation Guidebook. Chapter 8. Pages 61-72.  
<http://www.dvrpc.org/reports/08030A.pdf>
- NJDOT and PennDOT Smart Transportation Guidebook. Chapter 9. Pages 73-81.  
<http://www.dvrpc.org/reports/08030A.pdf>
- Jeff Speck: The Walkable City. TED (video):  
[http://www.ted.com/talks/jeff\\_speck\\_the\\_walkable\\_city](http://www.ted.com/talks/jeff_speck_the_walkable_city)

9. July 23: Climate Change and Transportation System Resiliency & Group Project Presentations

Reading Reactions Due by 5 p.m. July 23:

- The Current State of Infrastructure and Climate Science:  
<http://www.theicnet.org/webinars/archive/04-30-14> (*webinar - allow 45 minutes to view this module*)
- Federal Highway Administration, Climate Change Adaptation Case Studies:  
[http://www.fhwa.dot.gov/environment/climate\\_change/adaptation/case\\_studies/](http://www.fhwa.dot.gov/environment/climate_change/adaptation/case_studies/) (*just pick one or two to review, you are not expected to read all of them*)
- Grist. Yes We Can Beat Climate Change, But It Will Take Massive International Government Coordination: [www.grist.org/climate-energy/yes-we-can-beat-climate-change-but-it-will-take-massive-international-government-coordination/](http://www.grist.org/climate-energy/yes-we-can-beat-climate-change-but-it-will-take-massive-international-government-coordination/)

10. July 27: Group Project Reports DUE (submit electronically to Blackboard)

No Reading Reactions this week

## Group Project Assignment Options:

Working with a group of 2 to 3 students complete one of the options below.

### Option A:

Design a public brochure that explains what sustainable transportation is, why it is important, and how we can achieve it to the general public. It should also include potential action steps that individuals can take to help make transportation more sustainable. You can use materials from the class, and your own research. Publication should be geared to public consumption, visually interesting, and use clear, concise language. It should follow a 'What' (define Sustainable Transportation), 'So What' (why do we need it), and 'What Now' (actions we can take to get there) format. Final product should be in the form of a pamphlet, which should be no more than 16 pages (8 pages with front and back). NYCDOT's Getting to Zero is a good example of the type of document we are looking for:

<http://www.nyc.gov/html/visionzero/assets/downloads/pdf/visionzero-getting-to-zero-2014.pdf>.

### Option B:

You are hired by DVRPC to create and conduct an infrastructure assets vulnerability study for the Delaware Valley region of southeastern PA and south-central New Jersey. The Federal Highway Administration has developed a manual (December 2012) and tool (the US DOT CMIP Climate Data Processing Tool, which is an Excel file format) to help guide you in your endeavor, to be found online at:

[http://www.fhwa.dot.gov/environment/climate\\_change/adaptation/publications\\_and\\_tools/vulnerability\\_assessment\\_framework/](http://www.fhwa.dot.gov/environment/climate_change/adaptation/publications_and_tools/vulnerability_assessment_framework/) and  
[www.fhwa.dot.gov/.../adaptation\\_framework/modules/user\\_guide/cmip3\\_climate\\_data\\_processing\\_tool.xlsm](http://www.fhwa.dot.gov/.../adaptation_framework/modules/user_guide/cmip3_climate_data_processing_tool.xlsm)

The CMIP tool can be used to give ideas of the type of data you'd need to pull as part of your vulnerability study and it should be used as part of your project. The Maine DOT study was a part of your lecture material and there are other recent students that you can also refer to in preparing your report, such as the Mass DOT project [http://www.woodsholegroup.com/project-descriptions/2013-005\\_MassDOT\\_Climate\\_Change.pdf](http://www.woodsholegroup.com/project-descriptions/2013-005_MassDOT_Climate_Change.pdf) and the New Hampshire DOT climate action plan:

<http://www.epa.gov/climatechange/impacts-adaptation/transportation-adaptation.html#adaptispiscataqua>.

FHWA also has some other information on case studies at:

[http://www.fhwa.dot.gov/environment/climate\\_change/adaptation/ongoing\\_and\\_current\\_research/vulnerability\\_assessment\\_pilots/index.cfm](http://www.fhwa.dot.gov/environment/climate_change/adaptation/ongoing_and_current_research/vulnerability_assessment_pilots/index.cfm)

Final product should be in the form of a report, which should be no more than 16 pages (8 pages with front and back).

### Option C:

Propose at least two transportation projects that could benefit from using the sustainable scoring process developed as part of the GreenRoads rating program. Refer to the GreenRoads Manual for information on the system and how to conduct ratings. <https://www.greenroads.org/366/the-greenroads-manual.html>. Some examples of how real-world projects have benefitted from this process include: the Yellowstone National Park <https://www.greenroads.org/141/26/pilot-project.html> and Bristol Street Widening Phase II <https://www.greenroads.org/141/55/pilot-project.html>. Prepare

sample “Featured Projects” information briefs for your projects. The projects that you create cannot be existing projects and must show your original ideas. Final product should be in the form of a short report no longer than 10 pages (5 pages with front and back) and the information briefs.