

**CME 507 Sustainable Transportation Systems  
(Currently under CME 594 – Transportation, Energy, Air Quality)  
Spring, 2007**

**Call Number:** 24031      **Time and Day:** 11:00-1:50 T      **Classroom:** 1033 ERF  
**Instructor:** Professor Jane Lin, ERF 2089; [janelin@uic.edu](mailto:janelin@uic.edu); 996-3068      **Credit hours:** 4

**Objectives:**

1. Introduce basic terminology, regulations, and analytical framework of transportation energy and air quality
2. Introduce the concepts of transportation sustainability, and life cycle analysis techniques
3. To have students become familiar with basic transportation emissions and energy models

**Prerequisites by topic:** CME 508

**Course Points:** assignments (30%), presentations/class discussions (30%), class project (40%)

**Readings:** to be distributed in class (see attached list of references)

**Assignments:** there are three assignments

**Class project:** air quality assessment of transportation system using what's learned in class. Final presentation of the class project is required.

**Presentations:** three presentations in addition to the final class project presentation are required. Topics are to be assigned during the class.

**Computer usage:** two computer labs: MOBILE6 and GREET at the CME computer lab. Please acquire userID and password from Kassem Saad at 1258 SEL, 6-3291, [ksaad@uic.edu](mailto:ksaad@uic.edu). You need to see him in person.

**Blackboard website:** course notes, announcements, assignments, material etc will be posted on the website. Please check the website as often as possible.

**Tentative schedule:**

	<b>Date</b>	<b>Topic</b>
Introduction	January 16	(a) Environmental regulations in the U.S: -National Environmental Protection Act (NEPA), -Motor vehicle emissions control, and -Fuel economy regulations. (b) <u>Class discussion</u> : sustainable transportation indicators and challenges; integrating sustainability into transportation planning process <u>Assignment #1</u> : literature review and writing
<b>Part I</b>	Jan 23	No class due to TRB
	<b>Jan 30 - Feb 20</b>	<b>Transportation network analysis basics</b>
	Jan 30-Feb 13	(a) Transportation network analysis
	Feb 20	(b) VMT estimation methods and issues, and <u>class discussion</u> : issues with travel models in emission analysis
	Feb 27	(c) <u>Student presentation</u> : (i) land use, transportation, and air quality; (ii) sustainable transportation <u>Assignment #2</u> : Network analysis
<b>Part II</b>	<b>Mar 6 – Apr 3</b>	<b>Mobile source emission and air quality modeling</b>
	Mar 6	(a) Mobile emission basics, and (b) <u>Class discussion</u> : vehicle activity data issues
	Mar 12	(c) Mobile emission modeling and issues
	Mar 19	(d) <u>Computer lab</u> : MOBILE6
	Mar 26	No class due to spring break
	Apr 3	(e) Basis of air quality modeling <u>Class project</u> : topic TBD
<b>Part III</b>	<b>Apr 10- 24</b>	<b>Transportation energy analysis</b>
	Apr 10	(a) Life-cycle analysis principles
	Apr 17	(b) Life cycle analysis for advanced vehicle technologies, and GREET model
	Apr 24	(c) <u>Computer lab</u> : GREET <u>Assignment #3</u> : transportation energy analysis
<b>Part IV</b>	<b>May 1</b>	<b>Environmental impact assessment</b>
<b>Conclusion</b>	<b>Finals week</b>	<b>Class project presentations</b>

## References (to be updated):

### (I) Introduction – Motor vehicle emission control history/regulations and fuel economy development in the U.S.

Brown, D. (ed.) (2002) *Effectiveness and Impact of Corporate Average Fuel Economy (CAFÉ) Standards*. Transportation Research Record & National Research Council, National Academy Press, Washington D.C.

Gertz, C. (2003) Lessons from a landmark US policy for transportation, land use and air quality, and implications for policy changes in other countries. *UNESCO*, Blackwell Publishing Ltd., Malden, MA 02148

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## **(II) Part I – Regional Transportation Modeling Practice for Air Quality Analysis**

### *Overview*

U.S. Department of Transportation (1993) *Manual of Regional Transportation Modeling Practice for Air Quality Analysis*. Prepared by Deakin, Harvey, Skabardonis, Inc., Berkely, sponsored by the National Association of Regional Council, Washington D.C., accessible at <http://tmip.fhwa.dot.gov/clearinghouse/docs/airquality/mrtm/ch2.strm>

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### *VMT estimation methods*

Cambridge Systematics et al. (1996) *Use of locality-specific transportation data for the development of mobile source emission inventories*. Final report, prepared for Mobile Sources Committee, Emission Inventory Improvement Program, U.S. Environmental Protection Agency, Office of Mobile Sources, Ann Arbor, MI 48105, September.

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Ito, D.T., D.A. Niemeier, and G. Garry (2001) Conformity: How VMT-speed distribution can affect mobile emission inventories. *Transportation* 28: 409-425

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*Land use, transportation, and air quality => sustainable transportation*

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### **(III) Part II – Motor vehicle emissions characteristics and modeling**

*Emission characteristics*

- Barth, M., An, F., Norbeck, J., and Ross, M. (1996) Modal Emissions Modeling: A Physical Approach, *Transportation Research Record* **1520**, National Research Council, Transportation Research Board, Wash. DC: 81-88
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- Cernuschi, S., Giugliano, M., Cemin, A, and Giovannini, I. (1995) Modal Analysis of Vehicle Emission Factors, *The Science of the Total Environment* **169**: 175-183
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*Vehicle characteristics data issues*

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U.S. Environmental Protection Agency (2002) *Updating Fuel Economy Estimates in MOBILE6.3, draft*, EPA420-P-02-005, M6-GHG.001, August

*Mobile emission modeling issues*

U.S. Environmental Protection Agency (2002) *User's Guide to MOBILE6.1 and MOBILE6.2: Mobile Source Emission Factor Model*, EPA420-R-02-028, October

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U.S. Environmental Protection Agency (2003) *Proof of Concept Investigation for the Physical Emission Rate Estimator (PERE) to be used in MOVES*, EPA420-R-03-005, February

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stabilized light duty vehicle and truck emissions, on *CD-ROM of the 82<sup>nd</sup> Transportation Research Board Annual Meeting*, Washington D.C., January

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#### **(IV) Part III – Transportation & energy**

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Akisawa, A. and Y. Kaya (1998) Two model analyses of the urban structure of minimal transportation energy consumption. *Applied Energy* 61, 25-39

Bezdek, R.H. and R.M. Wendling (2003) Potential long-term impacts of changes in US vehicle fuel efficiency standards. *Energy Policy*

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#### **(V) Part IV – Environmental impact assessment**

Adler, K., M. Grant, W. Schroerer (1998) The emissions reduction potential of the congestion mitigation and air quality improvement (CMAQ) program: a preliminary assessment, on *CD-ROM of the 77<sup>th</sup> Transportation Research Board Annual Meeting*, Washington D.C., January

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Office of Air Quality Planning and Standards: <http://www.epa.gov/oar/oaqps>

EPA, Office of Transportation & Air Quality: <http://www.epa.gov/otaq/>

Transportation conformity: <http://www.epa.gov/otaq/transp/traqconf.htm>

National annual air quality trend: <http://www.epa.gov/airtrends/reports.html>

California Air Resources Board: <http://www.arb.ca.gov/>

Air quality models: <http://www.arb.ca.gov/html/soft.htm#modeling>

U.S. Department of Energy: <http://www.energy.gov>

Energy Efficiency and Renewable Energy: <http://www.eere.energy.gov>

Oak Ridge National Laboratory

Center for Transportation Analysis: <http://cta.ornl.gov>

Transportation Energy Data Book: <http://www-cta.ornl.gov/data>

Argonne National Laboratory: [www.anl.gov](http://www.anl.gov)

GREET model: <http://greet.anl.gov>

U.S. Census Bureau: <http://www.census.gov>

Vehicle inventory and use survey: <http://www.census.gov/svsd/www/content.html>

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