The objective of this course is to analyze the factors that contribute to the impact of motor vehicle emissions on urban air quality and present the techniques and models that can be used to quantify these impacts. The early part of the course deals with questions related to the characterization and quantification of emissions from the road transport fleet while the latter part deals with questions related to the impact of these emissions on air quality and human health. The course will require significant reading and discussion in class.

<table>
<thead>
<tr>
<th>Week</th>
<th>Subjects</th>
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<tbody>
<tr>
<td>1</td>
<td>Motor vehicle emissions and environmental impacts in the context of Sustainable Transport. Overview of motor vehicle emissions and types of measures for abatement.</td>
</tr>
<tr>
<td>2</td>
<td>Conventional and alternative fuels and technologies. Primary energy sources and energy carriers. Fuel properties, reformulation and additives</td>
</tr>
<tr>
<td>3</td>
<td>Stoichiometric, thermodynamic and kinetic considerations in pollutant formation. Mechanisms of pollutant formation and emission in internal combustion engines.</td>
</tr>
<tr>
<td>4</td>
<td>Emission control technology: gasoline and diesel, engines and after-treatment devices. Inspection and maintenance programs, remote sensing of exhaust emissions.</td>
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<tr>
<td>6-8</td>
<td>Emission modelling principles and approaches, relation to transportation demand models. The U.S. EPA's MOBILE emission model and Canadian adaptation.</td>
</tr>
<tr>
<td>9</td>
<td>Dispersion and receptor model applications for motor vehicle emissions in urban micro-environments.</td>
</tr>
<tr>
<td>10</td>
<td>Regional air quality models, UAM, MODELS-3/CMAQ</td>
</tr>
<tr>
<td>11-12</td>
<td>Health effects of different emissions. Methods for quantifying personal exposure. Epidemiological studies and the quantification of health vs. pollution control costs.</td>
</tr>
</tbody>
</table>
Reference Books

The web URLs through which reference documents are listed as available may have changed after this list was compiled. Very often, they are still available in another part of the same institutional web site and you may be able to reach them through Google searches on the web or within the specific web site.


Heinsohn, R.J., Kabel, R.L., *Sources and Control of Air Pollution*, Prentice-Hall, 1999. (Chapter 7 Formation and Control of Pollutants in Combustion Systems, 48 pages, deals with both stationary and mobile sources)


    Module 1a: The Role of Transport in Urban Development Policy
    Module 4a. Cleaner Fuels and Vehicle Technologies
    Module 4b: Inspection & Maintenance and Road worthiness
    Module 5a. Air Quality Management


**Journals**

*Journal of the Air and Waste Management Association*
*Atmospheric Environment*
*Environmental Science and Technology*

regularly carry papers of interest for motor vehicle emissions and urban air quality. The Society of Automotive Engineers (SAE) publishes various papers and volumes on specialized aspects of motor vehicle emissions (see web page address below).

**Web sites**

It is possible to locate background information on traffic related air pollution as well as the most significant technically oriented material at various sites on the internet. The sites of key organizations below provide useful starting points and will be referred to during lectures.

Chevron Motor Fuels  
http://www.chevron.com/products/prodserv/fuels/

Motor Gasolines Technical Review  

Diesel Fuels Technical Review  

U.S. EPA Office of Transportation and Air Quality (formerly Office of Mobile Sources)  
http://www.epa.gov/otaq/index.htm

Coordinating Research Council  
http://www.crcao.com/

Health Effects Institute  
http://www.healtheffects.org/

Emissions Research and Measurement Division of Environment Canada  
http://www.etcentre.org/organization/ermd/ermd_summary_e.html

EMBARQ – (World Resource Institute) WRI Center for Sustainable Transport  
http://www.embarq.org/en/about/about-embarq

Manufacturers of Emission Controls Association (MECA)  
http://www.meca.org/
Society of Automotive Engineers (SAE)
http://www.sae.org/servlets/index

Web page for distributing course material
http://www.carleton.ca/%7Edkarman/81571.html

Evaluation of Students' Work:
20% Assignments
20% Term paper
20% 1 mid-term examination
40% Final Examination

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