Course Outline (2019)
ENVE 3004: Contaminant Fate and Transport in the Environment

Instructor: Amir Hakami
Room ME2374/MC3091, ext 8609, amir_hakami@carleton.ca
Office hours: Fridays, 10:00-12:00

Assistant: Sina Voshtani (SinaVoshtani@cmail.carleton.ca)
Office and hours: TBD

Course components:
Lectures: 3 hours a week
Tutorial: 1 hour a week

Evaluation:
15 % Assignments
30 % Midterm
55 % Final exam

Examinations:
Midterm: March 8

The final examination is for evaluation purposes only and exam papers will not be returned. Acquiring a passing grade in this course requires a) an overall passing grade and b) a minimum final exam grade of 40%. You are also required to attend lectures and PA sessions.

Communications and course material:
All course materials (if applicable) will be posted to the connect web page for the course. Electronic communications with me and Sina must be carried out through your official Carleton email only. You can stop by my office anytime and outside the office hours, but be aware that I may be busy and ask you to come back at a later time. All assignments should be turned in at the beginning of the class when they are due. Penalties for late submissions are 25% within an hour, and 50 % within a day. Submissions after 24 hours receive no credit. If solutions are posted (or provided in another fashion) within a day, late submissions won’t be accepted. Students can discuss assignments with each other, but the submitted material needs to be your individual work. Make sure what you submit is your work performed for the sole purpose of this course; see institutional guidelines on plagiarism (http://www.carleton.ca/cuuc/regulations/acadregsuniv14.html).
### Course and Lecture layout (subject to modifications):

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-6</td>
<td>Fundamentals of contaminant transport: modeling and environmental models, sources and receptors in environmental transport modeling, categorization of environmental models, transport phenomena in different media, mass balance in environmental systems; physical properties, equilibrium and partitioning, partitioning coefficients, partitioning in mixtures, fugacity, kinetics of intermedia transfer; advection, advection in different media, molecular diffusion and random walk, turbulence and dispersion, dispersion in different media, multidimensional dispersion, puff equation, advection-diffusion equation, temporal and spatial scales in dispersion.</td>
</tr>
<tr>
<td>7-8</td>
<td>Contaminant transport in air: structure of the atmosphere, wind in atmosphere, pressure structure and barometric law, buoyancy and lapse rate and stability, Gaussian plume models, plume rise calculations, atmospheric dispersion modeling.</td>
</tr>
<tr>
<td>9-10</td>
<td>Contaminant transport in groundwater: saturated and vadose zones, Darcy’s law, hydraulic conductivity and permeability, dispersivity, 1-D equation for instant and continuous sources, retardation, sorbed transport of reactive contaminants, pump and treat, transport in vadose zone.</td>
</tr>
<tr>
<td>11-12</td>
<td>Contaminant transport in surface water: pollutant release and mixing in rivers and streams, dispersion coefficient in rivers, dissolved oxygen, DOD and BOD in rivers, Streeter-Phelps equation</td>
</tr>
</tbody>
</table>

**Textbooks:**

*Note that there will be some additional material covered in the lectures. Your main source for the course contents shall be your class notes.*

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**Academic Accommodation** You may need special arrangements to meet your academic obligations during the term. For an accommodation request the processes are as follows:

**Pregnancy obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see the [Student Guide](http://www2.carleton.ca/equity/ccms/wp-content/ccms-files/Student-Guide-card-09.pdf)

**Religious obligation:** write to me with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details see the [Student Guide](http://www2.carleton.ca/equity/ccms/wp-content/ccms-files/Student-Guide-card-09.pdf)

**Academic Accommodations for Students with Disabilities:** The Paul Menton Centre for Students with Disabilities (PMC) provides services to students with Learning Disabilities (LD), psychiatric/mental health disabilities, Attention Deficit Hyperactivity Disorder (ADHD), Autism Spectrum Disorders (ASD), chronic medical conditions, and impairments in mobility, hearing, and vision. If you have a disability requiring academic accommodations in this course, please contact PMC at 613-520-6608 or [pmc@carleton.ca](mailto:pmc@carleton.ca) for a formal evaluation. If you are already registered with the PMC, contact your PMC coordinator to send me your Letter of Accommodation at the beginning of the term, and no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with me to ensure accommodation arrangements are made. Please consult the [PMC website](http://www2.carleton.ca/equity/ccms/wp-content/ccms-files/Student-Guide-card-09.pdf) for the deadline to request accommodations for the formally-scheduled exam (if applicable).