# logo *Department of Environmental Scienc & Management*

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| **Course Number** | **479/579** |
| **Title** | **Fate and Transport of Toxics in the Environment** |
| **Section** | **001** |
| **CRN(s)** |  |
| **Credits** | **4** |
| **Design Credits** | **0** |
| **Prerequisite(s)** | Senior or Grad Standing |
| **Days/Time** | **MW 1600-1750** |
| **Location** | **EB 310** |
| **Final Exam Day/Time** | M 12/7 6 pm |

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| **Course Website** |  |

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| **Instructor** | **William Fish** |
| **Office** | **EB202E** |
| **Phone** | **503-725-4278** |
| **E-mail** | [**fishw@cecs.pdx.edu**](mailto:fishw@cecs.pdx.edu) |
| **Office Hours** | MW 4-5 |
| **Mailbox Location** | CEE Office EB 200 |

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| **Required Text or Other Materials:** Chemical Fate and Transport in the Environment, Hemond/Fechner-Levy |
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| **Recommended References/Optional Text/Supplemental Readings & Resources:** |
| **N/a** |
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| **Catalog Course Description:** Chemical, physical, and biological principles that govern the behavior of toxic materials such as heavy metals and synthetic organic compounds in the environment. Course emphasizes practical ways to represent chemical processes in models of pollutant behavior. Topics include: adsorption of pollutants on soils and sediments; transport across sediment-water and air-water interfaces; bioamplification of pollutants; multiphase fugacity models of organics; case studies of contaminated surface water, sediment and groundwater. |
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| **Design/Professional:** |
| N/a |

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| Course Objectives – Students must demonstrate the ability to: |
| 1. Students will recognize and understand the ways in which the fate and transport of toxic chemicals is critical to understanding many important environmental problems.  2. Students will understand the basic scientific and engineering principles that underlie the fate and transport of chemicals, including environmental chemistry, physics and biology.  3. Students will have a good command of the vocabulary essential for communicating on this subject with environmental engineers, scientists, and regulatory agencies.  4. Students will be able to analyze and solve fate and transport problems in each of the topic areas covered in class, including the behavior of chemicals in lakes, rivers, estuaries and sediments. |

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| **Course Requirements:** Lecture and discussion during the class periods. Students are expected to have completed the assigned reading before class and be prepared to discuss the material during class and answer questions from the instructor. Tw midterm exams and a final project. Problem sets are posted on the [course web site](http://www.ce.pdx.edu/~fishw/FT-home.htm). |
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| Course Grading | |
| **Assignment** | **Points Assigned or % of Total Grade** |
| Weekly Problem Sets (8 total) | 30% |
| Midterm exam 1 | 20% |
| Midterm exam 2 | 20% |
| Final Project | 20% |
| Class preparedness/participation | 10% |
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| **Incompletes:** A grade of “I” is granted by the instructor *only* with prior approval and consent. Criteria are outlined in the PSU Bulletin. **Program requirements:** {for UG courses} The CEE Department requires that junior and senior engineering courses must be completed with a minimum grade of C-, and a student’s cumulative PSU GPA must be 2.25 or higher to graduate from the BSCE program. | |

**Course Schedule**

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| **Lecture**    1 | **Week**  Mon  Wed | **Quiz Preview** [**1**](http://www.ce.pdx.edu/~fishw/FT_PrepChek01.pdf) | **Topic**  Introduction; Mass Balance and Units;  Physical transport of chemicals: Intro | **Reading**  [1.1 - 1.3](http://www.ce.pdx.edu/~fishw/FT_L01-T-11-15.pdf)  [1.4 - 1.5](http://www.ce.pdx.edu/~fishw/FT_L01-T-11-15.pdf) | **Supplemental Info and Lecture Notes(LNx)**  [LN0](file:///\\Webserver\fishw\FT_00-LN.pdf) [**LN1**](http://www.ce.pdx.edu/~fishw/FT_L01-LN.pdf) |
| 2 | Mon  Wed | No quiz  [2](http://www.ce.pdx.edu/~fishw/FT_PrepChek02.pdf) | Advection-diffusion equation   Physical transport in Rivers | [2.1 - 2.2.1](file:///\\Webserver\fishw\FT_L01-T-21-221.pdf)  [Derivation of ADE](file:///\\Webserver\fishw\FT_L3_ADE_Derive.pdf) (Quiz on 2.2.1) | [The ADE Part I](file:///\\Webserver\fishw\FT_ADE-Readings.pdf)  [The ADE  Part II](file:///\\Webserver\fishw\FT_ADE-Readings2.pdf) [LN04](file:///\\Webserver\fishw\FT_04-LN.pdf), [LN04B](file:///\\Webserver\fishw\FT_04B-LN.pdf) |
| 3 | Mon  Wed | No quiz  [3](http://www.ce.pdx.edu/~fishw/FT_PrepChek03.pdf) | Application of ADE in Rivers  [Physical transport in Lakes](http://www.ce.pdx.edu/~fishw/FT-Lect08.pdf) | [The ADE Part III](file:///\\Webserver\fishw\FT_ADE-Readings3.pdf)  [2.2.2](file:///\\Webserver\fishw\FT_L06-Lakes-Estuar.pdf) | [LN05](file:///\\Webserver\fishw\FT_L05-LN.pdf), [LN05B](file:///\\Webserver\fishw\FT_L05B-LN.pdf)  [LN06](file:///\\Webserver\fishw\FT_06-LN.pdf) |
| 4 | Mon  Wed | [4](http://www.ce.pdx.edu/~fishw/FT_PrepChek04.pdf) | Physical transport in Estuaries | [2.2.3](file:///\\Webserver\fishw\FT_L06-Lakes-Estuar.pdf)  [Estuaries](file:///\\Webserver\fishw\FT_Estuary.pdf), [EstuariesB](file:///\\Webserver\fishw\FT_EstuaryB.pdf) | [LN07](file:///\\Webserver\fishw\FT_07-LN.pdf)  [Salinity Measurement](file:///\\Webserver\fishw\FT_SalinityDeterm.pdf) |
| 5 | Mon  Wed |  | Columbia River Estuary Guest Lecturer: Dr. David Jay  [MIDTERM EXAM 1](http://www.ce.pdx.edu/~fishw/MT-01_Concepts-2008.pdf) Click above link for Review [Midterm 1 SOL'N SET](file:///\\Webserver\fishw\FT-tba.htm) | [EXAM covers thru Wed, Wk 4](http://www.ce.pdx.edu/~fishw/MT-01_Concepts-2008.pdf) |  |
| 6 | Mon  Wed | [5](http://www.ce.pdx.edu/~fishw/FT_PrepChek05.pdf)  [7](file:///\\Webserver\fishw\FT_Pchek07b-2009.pdf) | [Basic environmental chemistry; Chemical kinetics](http://www.ce.pdx.edu/~fishw/FT-Lect11.pdf)  Chemical distribution among phases | [1.6 - 1.6.6 2.4.1](file:///\\Webserver\fishw\FT_09-Chemistry.pdf)  [1.8 - 1.8.3; 2.2.5](file:///\\Webserver\fishw\FT_11-18-225.pdf) [\*\*Koc-Kom Notes](file:///\\Webserver\fishw\FT_Kom-Koc.pdf) | [LN09](file:///\\Webserver\fishw\FT_L09-LN.pdf)    [LN11](file:///\\Webserver\fishw\FT_11-LN.pdf) |
| 7 | Mon  Wed | [8](http://www.ce.pdx.edu/~fishw/FT_PrepChek07.pdf) | Modeling Pollutants in Aquatic Sediments  [Air-water exchange](http://www.ce.pdx.edu/~fishw/FT-Lect10.pdf) | [2.3 - 2.3.4](file:///\\Webserver\fishw\FT_L12-AirWater.pdf) | [LN12](file:///\\Webserver\fishw\FT_12-LN.pdf) |
| 8 | Mon      Wed | 9    [10](http://www.ce.pdx.edu/~fishw/FT_PrepChek10.pdf) | BOD Modeling Dissolved Oxygen    [Biotransformation and biodegradation Lect. Notes I)](http://www.ce.pdx.edu/~fishw/FT-Lect13.pdf) | [2.5](file:///\\Webserver\fishw\FT_L13-BOD25.pdf) [BOD Sect. 5.5](file:///\\Webserver\fishw\FT_10-BOD1.pdf) [BOD Sect. 5.6](file:///\\Webserver\fishw\FT_13-BOD2.pdf)  [2.6.1 - 2.6.3](file:///\\Webserver\fishw\FT_L14-15-26-272.pdf) Includes readings for next 2 lectures | [LN13](file:///\\Webserver\fishw\FT_10-LN.pdf)    [Lect notes: Part II](file:///\\Webserver\fishw\FT_14-LN02.pdf) |
| 9 | Mon   Wed | [11](http://www.ce.pdx.edu/~fishw/FT_PrepChek11.pdf) | [Abiotic chemical transformations](http://www.ce.pdx.edu/~fishw/FT-Lect14.pdf)  Bioconcentration & bioaccumulation | 2.7 - 2.7.2 (See prior download)  2.6.4 (See prior download) |  |
| 10 | Mon  Wed | [12](file:///\\Webserver\fishw\FT_PrepChek12-2008.pdf) | [**MIDTERM EXAM 2 REVIEW**](file:///\\Webserver\fishw\FT_MT2-Concepts2008.pdf)  [Modeling Bioaccumulative Pollutants and the Role of Sediments](http://www.ce.pdx.edu/~fishw/ECR-ColSloughRA.pdf) | **<== NOTE NEW EXAM DATE**  [Organics and Adsorption](file:///\\Webserver\fishw\FT_14-OrgCarb.pdf)  [Role of Sediments as Source (Lect Notes)](file:///\\Webserver\fishw\FT_LN-LastDay-Sediments.pdf) |  |
| Finals Week | Mon |  | [FINAL EXAM](http://www.ce.pdx.edu/~fishw/FinalConcepts-2008.pdf) | [REVIEW](file:///\\Webserver\fishw\FinalConcepts-2008.pdf) |  |

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| **Resources** |
| As a PSU student, you have numerous resources at your disposal. Please take advantage of them while you are here. A small sample is listed below: |
| * CE Website (includes program info, job listings, etc.): <http://www.cee.pdx.edul> |
| * Career Center: <http://www.career.pdx.edu/> |
| * Center for Student Health & Counseling: <http://www.shac.pdx.edu/> |
| * The Writing Center: <http://www.writingcenter.pdx.edu/> |
| * PSU Disability Resource Center: 435 Smith Memorial Union |
| Note: The PSU Disability Resource Center is available to help students with academic accommodations. If you are a student who has need for test-taking, note-taking or other assistance, please visit the DRC and notify the instructor at the beginning of the term. |

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| **Introduction to Library and Literature Research** |
| With the advent of the Internet it is very tempting to think that all necessary resources for a term project will be available in full text after typing in a few words at Google.com. This is not the case. You will often need to go to the library, use real library search tools and access real books and articles contained in refereed/archival journals. |
| Be sure to make use of the Vikat library catalog. Go to the PSU library home page at <http://www.lib.pdx.edu/>. Also available on the library home page are Full Text Electronic Journals: <http://www.lib.pdx.edu/~bvws/bytitle.html>, and a list of on-line Databases: <http://www.lib.pdx.edu/resources/databases/databases.html>. Try EI Compendex (<http://www.ei.org/ev2/ev2.home>) and Lexis-Nexis. Note that access to these databases is free for PSU students, but you must be using a computer on campus or via a dial-in service. See <http://www.lib.pdx.edu/services/distance/proxyserver.html> for instructions on how to gain off-campus access using a proxy server. |

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| **Campus Safety** |
| The University considers student safety paramount. The Campus Public Safety Office is open 24 hours a day to assist with personal safety, crime prevention and security escort services. Call 503-725-4407 for more information. For Campus emergencies call 503-725-4404. |