

**ENVH 514 - Fundamentals of Toxicology  
COUSE SYLLABUS**

**Autumn Quarter, 2015 - MWF 11:30-12:20,  
Location: HSB T478**

**Course Director:**

**Dr. Zhengui Xia, Professor and Director, Room HSB-F561C, Phone 616-9433  
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**Guest lecturers:**

Dr. Nadia Moore <[nmoore@veritox.com](mailto:nmoore@veritox.com)>  
Dr. Julia Yue Cui <[juliacui@uw.edu](mailto:juliacui@uw.edu)>  
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Dr. Cecile Krejsa <[cmkrejsa@earthlink.net](mailto:cmkrejsa@earthlink.net)>  
Dr. Katie Sprugel <[ksprugel@gmail.com](mailto:ksprugel@gmail.com)>

**Course Overview:** In this class, we will discuss fundamental cellular processes and core areas of toxicology, including dose response, absorption, distribution, metabolism, and excretion of toxicants, toxicity testing, interpretation of toxicological data, biochemical, cellular, and physiological mechanisms by which chemicals produce toxic responses. We will also explore mechanisms and fate of chemical interaction with biological systems. With the information gathered from this class, students will derive an enhanced understanding for how foreign chemicals, including pharmaceuticals and environmental agents, interact with cellular pathways to effect toxicological insult. Students will also gain appreciation on basic aspects of biotech and regulatory toxicology. Guest lecturers will provide valuable assistance in the course to provide coverage of subject areas within their respective areas of expertise.

**Learning objectives:** At the end of this course, the student will be able to

- 1) Explain dose-response theory;
- 2) Describe the processes of absorption, distribution, metabolism, and excretion (ADME) of toxicants
- 3) Describe reactions and enzymes involved in biotransformation
- 4) Describe basic principles of genetic toxicology
- 5) Identify signal transduction pathways
- 6) Explain risk assessment
- 7) Describe biochemical mechanisms of toxicity
- 8) Define basic principles of toxicokinetics
- 9) Describe biotech/regulatory Toxicology
- 10) Define cell death & apoptosis

- 11) Discuss toxicogenomics
- 12) Discuss proteomics
- 13) Discuss metabonomics
- 14) Discuss ecogenetics/Env. Epidemiology
- 15) Describe chemical contribution of carcinogenesis; different stages of carcinogenesis; key molecular players in carcinogenesis

**Intended Student Audience:** The ENVH 514 serves as one of the core fundamentals of the toxicology program for Toxicology graduate students in the Department of Environmental and Occupational Health Sciences. It is also appropriate for those senior undergraduate students or graduate students from other allied biomedical science departments, e.g., Epidemiology, Fisheries, Chemistry, Molecular & Cellular Biology, Pharmacology, and School of Pharmacy etc. who are interested in gaining a basic understanding of toxicology. Prerequisites for this class include a year of undergraduate general biology, two quarters of chemistry, and/or biochemistry.

**Required Reading:** Handout materials will be provided for most classes and are the focus of class material.

The reference textbook for ENVH 514 is: Casarett and Doull's Toxicology: the Basic Science of Poisons; CD Klaassen, ed.; 8th Edition (2013).

*A copy of this textbook is available at the HS library UW and reserved for the class (Health Sciences Library Books QV 600 C335 2013).*

*The E-book is also available online, sign in with the UW Libraries (UWnetid) to access:*

[http://alliance-primo.hosted.exlibrisgroup.com/UW:course\\_reserves:CP71193544860001451](http://alliance-primo.hosted.exlibrisgroup.com/UW:course_reserves:CP71193544860001451)

**Grading:** The final grade for this class will be compiled from 2 in-class exams and one take-home exam, each accounts for 1/3 of the final grade.

Disability Resources for Students (DRS) offers resources and coordinates reasonable accommodations for students with disabilities. Reasonable accommodations are established through an interactive process between you, your instructor(s) and DRS. If you have not yet established services through DRS, but have a temporary or permanent disability that requires accommodations (this can include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), you are welcome to contact DRS at 206-543-8924 or [uwdrs@uw.edu](mailto:uwdrs@uw.edu) or [disability.uw.edu](http://disability.uw.edu)

<u>Date</u>	<u>Topics</u>	<u>Reading</u>	<u>Instructor</u>
Sept. 30	Course Overview; Introduction; Dose-Response	Chapter 1,2	Xia
Oct. 2	Animal toxicity tests and variation in toxic response	Chapter 2	Xia
Oct. 5	Absorption: oral, skin	Chapter 5	Xia
Oct. 7	Absorption: oral, skin (continued)	Chapter 5	Xia
Oct. 9	Lung - Structure/Function & Absorption/Inhalation	Chapter 5	Nadia Moore
Oct. 12	Distribution and Excretion	Chapter 5	Xia
Oct. 14	Biotransformation I	Chapter 6	Kavanagh
Oct. 16	Biotransformation II	Chapter 6	Kavanagh
Oct. 19	<b>In class exam</b>		Xia
Oct. 21	Mechanisms of Toxicity I, repair	Chapter 3	Kavanagh
Oct. 23	Mechanisms of Toxicity II, repair	Chapter 3	Kavanagh
Oct. 26	Genetic Toxicology and genetic toxicity tests	Chapter 9	Kavanagh
Oct. 28	Toxicokinetics I	Chapter 7	Kelly
Oct. 30	Toxicokinetics II	Chapter 7	Kelly
Nov. 2	Signal Transduction I	Chapter 3	Xia
Nov. 4	Signal Transduction II	Chapter 3	Xia
Nov. 6	Cell death and apoptosis	Chapter 3	Xia
Nov. 9	Apoptosis and signaling in Toxicology II	Handouts	Xia
<b>Nov. 11</b>	<b>VETERAN'S DAY--no class</b>		
Nov. 13	Ecogenetics/Env. Epidemiology	Handouts	Eaton
Nov. 16	<b>In Class Exam</b>		Xia
Nov. 18	Toxicogenomics/toxicoeepigenomics	Handouts	Cui
Nov. 20	Proteomics	Handouts	Jim Bruce
Nov. 23	Risk Assessment I	Chapter 4	Faustman
Nov. 25	Risk Assessment II	Chapter 4	Faustman
<b>Nov. 27</b>	<b>THANKSGIVING--no class //email out final take home exam Q.</b>		
Nov. 30	Metabonomics	Handouts	Kavanagh
Dec. 2	Carcinogenesis I	Chapter 8	Xia
Dec. 4	Carcinogenesis II	Chapter 8	Xia
Dec. 7	Carcinogenesis III	Chapter 8	Xia
Dec. 9	Biotech/Regulatory Toxicology I	Chapter 35	Sprugel
Dec. 11	Biotech/Regulatory Toxicology II	Chapter 35	Krejsa
Dec. 15	<b>Take Home Final due 1 pm</b>		