

# Course Syllabus

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## ENVH 515 –ORGAN SYSTEMS TOXICOLOGY and PATHOLOGY

Winter Quarter, 2021 - MWF 11:30-12:20

Zoom link Meeting ID: 983 3675 0758

Instructor: Dr. Terry Kavanagh; 206-685-8479 (tjkav@uw.edu)

Appointments with Dr. Kavanagh by arrangement.

ENVH 515 is the second course of a three-course sequence, with ENVH 514 (Dr. Julia Cui) and ENVH 516 (Dr. Lucio Costa). The overall goal is for students to gain a basic working knowledge of how chemicals interact with biological systems to produce adverse effects, i.e., the science of toxicology. The second quarter of this series is organized with sections pertaining to target organs and/or organ systems. Thus, the second quarter of this series will concentrate on organ toxicology and pathology while the first quarter concentrated on basic concepts and mechanisms of toxicology, and the third quarter will concentrate on specific agents. Guest lecturers are a valuable asset to the course in general and will assist in providing 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. Describe the response of tissues to toxicant induced injury
2. Describe histological and morphometry methods used by toxicological pathologists to evaluate and quantify toxicant induced tissue injury
3. Describe the major cell types in the nervous system, the anatomy of blood brain barrier and the effects of toxicant exposure on nervous system development and function
4. Describe tests commonly used to evaluate behavioral toxicants, and the effects of neurotoxic chemicals on behavior
5. Describe the anatomy and function of the liver and the GI tract, and have understanding of commonly used biomarkers of toxicant induced injury to these organs and the role of the microbiome.
6. Describe the anatomy and function of the kidney, and have understanding of commonly used biomarkers of toxicant induced kidney injury
7. Describe the major cell types and mediators involved in the immune system and how to assess their function in the context of toxic chemical exposure
8. Define the models used to evaluate teratogenic potential, understand the basis for selective windows of susceptibility for developmental toxicants, describe the cellular anatomy of reproductive tissues and the effects of toxicants on their function
9. Describe the anatomy and function of the respiratory system, and the effects of inhaled toxicants on the lung
10. Discuss the effects of toxicant exposure toward the skin and sensory organs

11. Describe the anatomy and function of the cardiovascular system, and define of the process of atherogenesis and the role that nutrition, chemical exposure and oxidative stress play in its pathophysiology
12. Describe the humoral and cellular components of the blood and bone marrow, and discuss common endpoints used to evaluate toxicant effects on the blood and bone marrow
13. Describe critical cell types, organs and hormones in the endocrine system, and have knowledge of the effects of endocrine disrupting chemicals

**Intended Student Audience:** The ENVH 514/515/516 course sequence serves as the core instructional material for Toxicology graduate students in the Department of Environmental and Occupational Health Sciences. Graduate students from other allied biomedical science departments and programs have also participated in the course. Prerequisites for this class include a year of undergraduate general biology and two quarters of organic chemistry. Previous background or concurrent registration in mammalian physiology is recommended.

**Required Reading:** The text for ENVH 515 is: Casarett and Doull's Toxicology: The Basic Science of Poisons; CD Klaassen, ed.; 9th Edition (2019), and is available at the Health Sciences Branch of the University Bookstore. A copy of this textbook is available electronically at UW:

<https://accesspharmacy.mhmedical.com/book.aspx?bookid=2462>

[\(https://accesspharmacy.mhmedical.com/book.aspx?bookid=2462\)](https://accesspharmacy.mhmedical.com/book.aspx?bookid=2462)

Additional handout materials will be provided for most classes and are required reading.

**Grading:** The final grade for this class will be based on accumulated scores from three exams (each worth 30% of the final grade for a total of 90%), plus 10% for class participation.

**Course Absence Policies:** It is your responsibility to notify the instructors by the end of the first week of any conflicts you may have with the exam schedule.

There will be no make-up examinations unless approved by the instructor in advance. If a test is missed because of an unexcused absence, it will not be rescheduled. Contact your instructor prior to or same day to notify him that you are unable to take the exam.

Your instructor will then set a date for a makeup exam, contingent on the student showing as soon as possible a valid medical note issued by a medical professional on the original exam date. For other reasons (car accident, death in the family etc.), arrange to speak with the instructor to explain the circumstances. Within reason we will expect to be notified prior to or the day of the exam for these instances.

If you have any concerns about the class, you may contact Dr. Kavanagh by phone or email to arrange a meeting. If you are still not satisfied with the response that you receive, you may contact the Department Chair. You may also contact the Graduate School at G -1 Communications Bldg, by phone at (206) 543-5139 or by email at [raan@uw.edu](mailto:raan@uw.edu)

## The University of Washington and Academic Integrity:

Students at the University of Washington (UW) are expected to maintain the highest standards of academic conduct, professional honesty, and personal integrity. The UW School of Public Health (SPH) is committed to upholding standards of academic integrity consistent with the academic and professional communities of which it is a part. Plagiarism, cheating, and other misconduct are serious violations of the University of Washington Student Conduct Code (WAC 478-120). We expect you to know and follow the university's policies on cheating and plagiarism, and the [SPH Academic Integrity Policy](https://sph.washington.edu/students/academic-integrity-policy) (<https://sph.washington.edu/students/academic-integrity-policy>) (Links to an external site.). Any suspected cases of academic misconduct will be handled according to University of Washington regulations. For more information, see the University of Washington Community Standards and Student Conduct website.

### University of Washington general policy statement:

"Admission to the University carries with it the presumption that students will conduct themselves as responsible members of the University community. As a condition of enrollment, all students assume responsibility to observe standards of conduct that will contribute to the pursuit of academic goals and to the welfare of the University community. That responsibility includes, but is not limited to:

Practicing high standards of academic and professional honesty and integrity;

1. Refraining from any conduct that would violate the rights, privileges, and property of others;
2. Refraining from any conduct that would substantially disrupt or materially interfere with University operations;
3. Refraining from any conduct that could reasonably cause harm to or endanger the health, safety, or welfare of other persons; and
4. Complying with the rules, regulations, procedures, policies, standards of conduct, and orders of the University and its schools, colleges, departments, units, and programs."

<https://www.washington.edu/admin/rules/policies/SGP/SPCH210.html>

(<https://www.washington.edu/admin/rules/policies/SGP/SPCH210.html>) (Links to an external site.)

For web-resources on understanding and avoiding plagiarism, please see:

<https://guides.lib.uw.edu/hsl/writer/plagiarism> (<https://guides.lib.uw.edu/hsl/writer/plagiarism>) (Links to an external site.)

### Access and Accommodations:

Your experience in this class is important to me. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to me at your earliest convenience so we can discuss your needs in this course. If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions 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 or disability.uw.edu. DRS offers resources and coordinates reasonable accommodations for students with disabilities and/or temporary health conditions. Reasonable accommodations are established through an interactive process between you, your instructor(s) and DRS. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law.

### **Commitment to Multicultural Inclusion:**

The UW School of Public Health seeks to ensure all students are fully included in each course. We strive to create an environment that reflects community and mutual caring. We encourage students with concerns about classroom climate to talk to your instructor, your advisor, a member of the departmental or SPH Diversity Committee and/or the program director. DCinfo@uw.edu is a resource for students with classroom climate concerns.

### **Religious Accommodations:**

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy, including more information about how to request an accommodation, is available at Religious Accommodations Policy (<https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/> (<https://registrar.washington.edu/staffandfaculty/religious-accommodations-policy/>)). Accommodations must be requested within the first two weeks of this course using the Religious Accommodations Request form (<https://registrar.washington.edu/students/religious-accommodations-request/> (<https://registrar.washington.edu/students/religious-accommodations-request/>)).

**Please Note: All slide files are for your use only; they are not for distribution outside of class.**

### **Lecture and Exam Schedule:**

<b>Date</b>	<b>Topic</b>	<b>Lecturer</b>	<b>Reading</b>
01/04/21	Cell & Tissue Response to Injury	Kavanagh	Handout
01/06/21	Histopathology/Morphometry	Kavanagh	Handout
01/08/21	Immunotoxicology I	Kavanagh	Chapter 12
01/11/21	Immunotoxicology II	Kavanagh	Chapter 12
01/13/21	Immunotoxicology III	Kavanagh	Chapter 12
01/15/21	Toxicology of the GI system	Cui	Handout
01/18/21	<i>NO CLASS - Martin Luther King Day Holiday</i>		
01/20/21	Toxicology of the Liver I	Kavanagh	Chapter13

01/22/21	Toxicology of the Liver II	Kavanagh	Chapter13
01/25/21	Toxicology of the Kidney I	Kelly	Chapter 14
01/27/21	Toxicology of the Kidney II	Kelly	Chapter 14
<b>01/29/21</b>	<b>EXAM I Covers: lectures 01/04/21 through 01/27/21</b>		
02/01/21	Neurotoxicology I	Costa	Chapter 16
02/03/21	Neurotoxicology II	Costa	Chapter 16
02/05/21	Respiratory System Toxicology I	Kavanagh	Chapter 15
02/08/21	Respiratory System Toxicology II	Kavanagh	Chapter 15
02/10/21	Respiratory System Toxicology III	Kavanagh	Chapter 15
02/12/21	Behavioral Toxicology	Kavanagh	Chapter 16
02/15/21	<i>NO CLASS - Presidents' Day Holiday</i>		
02/17/21	Developmental/Repro Toxicology I	Faustman	Chapters 10, 20
02/19/21	Developmental/Repro Toxicology II	Faustman	Chapters 10, 20
02/22/21	Developmental/Repro Toxicology III	Faustman	Chapters 10, 20
02/24/21	<b>EXAM II Covers: lectures 02/01/21 through 02/22/21</b>		
02/26/21	Blood & Bone Marrow Toxicity I	Kavanagh	Chapter 11
03/01/21	Blood & Bone Marrow Toxicity II	Kavanagh	Chapter 11
03/03/21	Toxicology of the Skin	Krejsa	Chapter 19
03/05/21	Toxicology of the Sensory Systems	Krejsa.	Chapter 17
03/08/21	Endocrine System Toxicology I	Kavanagh	Chapter 21
03/10/21	Cardiovascular Toxicology I	Rosenfeld?	Chapter 18
03/12/21	Cardiovascular Toxicology II	Rosenfeld?	Chapter 18
<b>03/17/21</b>	<b>EXAM III 2:30 - 4:20 p.m. Covers: lectures 02/24/21 through 03/12/21</b>		

## Course Summary:

Date	Details	Due
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