

SYLLABUS

COURSE: Toxicology – PATH-438

LENGTH OF COURSE: 1.5 units, 22 hours (2 hours lecture/week)

COURSE DESCRIPTION: Toxicology studies the body's response to drugs, foods, and toxic substances. Fundamentals of pharmacology and mechanisms of action are examined for acute and chronic exposure derived from environmental, dietary, occupational and pharmaceutical sources. Emphasis is placed on information literacy to support problem-based and evidence-based learning.

PREREQUISITES: CHEM-223, PATH-217

COURSE OFFERED BY: Basic Sciences Department

REQUIRED TEXT: Whalen, Finkel, and Panavelil, Pharmacology, 6th ed. (Lippincott Williams & Wilkins: 2015).
Lieberman and Peet, Mark's Basic Medical Biochemistry: A Clinical Approach, 5th ed. (Wolters Kluwer: 2018).

RECOMMENDED TEXT: (1) Hodgson, A Textbook of Modern Toxicology, 4th ed. (J Wiley & Sons: 2010).
(2) Molecular and Biochemical Toxicology, 4th ed., Smart and Hodgson, eds. (J Wiley & Sons: 2008).
(3) Frank and Ottoboni, The Dose makes the Poison: A Plain-language Guide to Toxicology, 3rd ed. eBook, (J Wiley & Sons: 2011).
(4) Ottoboni, The Dose makes the Poison: A Plain-language Guide to Toxicology, 2nd ed., (J Wiley & Sons: 1997).
(5) A-Z Guide to Drug-Herb-Vitamin Interactions, 2nd ed., Gaby, Batz, Chester and Constantine, eds. (Three Rivers Press: 2006).
(6) Gilbert, A Small Dose of Toxicology: The health effects of common chemicals, (CRC Press: 2004).
(7) Gibson, Multiple Chemical Sensitivities: A survival guide, (New Harbinger Publications: 2000).
(8) Toxicology and Clinical Pharmacology of Herbal Products, Cupp and Karch, eds. (Springer-Verlag: 2000).
(9) Lawson, Staying Well in a Toxic World, (Lynwood Press: 2000).

REFERENCE TEXTS: (1) Casarett & Doull's Toxicology, 9th ed., Klaassen ed. (McGraw Hill: 2019).

(2) Gaby, Nutritional Medicine, 2nd ed., (Perlberg Publishing: 2017).

MATERIALS:

- (1) Handouts (provided by instructor and posted to Canvas)
- (2) Canvas serves as the central, accessible site to share material and exchange information between students and the instructor.

METHOD OF INSTRUCTION: Lectures and group study centered on clinical conditions; on-line and learning center (library) research; in-class reviews, reporting and assessments with instructor; access to Canvas site for links to reference citations.

EVALUATION:

(1) HOMEWORK (Weeks 2 through 9): Six total HW assignments of one to three questions. (25 pts each)

(2) MIDTERM EXAM: Take-home exam posted to the Canvas site will test the fundamentals of pharmacokinetics, pharmacodynamics, detoxification pathways, biochemistry, text book topics, and technical material of lectures. All work is that of the individual student. No collaboration is allowed for the completion of the take-home exam. (100 pts)

(3) FINAL EXAM (Week 11): Final exam will assess student knowledge of clinical, pharmacological, and toxicological topics. (100 pts)

(4) QUIZZES: Administered within Canvas; align with course SLOs. Maximum of five quizzes. (50 pts)

TOTAL: 400 points

GRADES:

A = 90 – 100 %

B = 80 – 89%

C = 70 – 79%

F = 69% and below (Student must repeat the course)

All work submitted must be done independently by the student.

Grades and the Grading System Final Grades are available online through the CAMS student portal. If there are any questions on grading procedures, computation of grade point average, or the accuracy of the grade report, please contact the Registrar's Office or the Office of Academic Affairs. Grades will be reported and evaluation will be based on the Academic Policies, Procedures, & Services. Please refer to Evaluation Policy (**Policy ID: OAA.0007**)

In order to maintain **Satisfactory Academic Progress**, a student must maintain a 2.0 or better in each and every course. **Any grade less than a C must be remedied by**

repeating the class. Please refer to Satisfactory Academic Progress (**Policy ID: OAA.0006**)

Attendance: Please refer to Attendance Policy (**Policy ID: OAA.0002**)

Conduct and Responsibilities: Please refer to the Personal Conduct, Responsibility and Academic Responsibility Policy (**Policy ID: OAA.0003**)

Make-up Exams: Please refer to Make-up Assessment Policy (**Policy ID: OAA.0001**)

Request for Special Testing: Please refer to Request for Special Testing (**Policy ID: OAA.0004**)

Accommodation for Students with Disabilities:

If you have approved accommodations, please make an appointment to meet with your instructor as soon as possible. If you believe you require an accommodation, but do not have an approved accommodation letter, please see the Academic Counselor Lori Pino in the Office of Academic Affairs. Contact info: Lpino@lifewest.edu or 510-780-4500 ext. 2061. Please refer to Service for Students with Disabilities Policy (**Policy ID: OAA.0005**)

Electronic Course Management:

Canvas is LCCW's Learning Management System (LMS). Canvas will be used throughout the quarter during this course. Lectures, reminders, and messages will be posted. In addition, documents such as the course syllabus and helpful information about the class project will be posted. Students are expected to check Canvas at least once a week in order to keep updated. The website address for Canvas is <https://lifewest.instructure.com/login/canvas> Please refer to the Educational Technologies Policy (**Policy ID: OAA.0009**)

EXTRA CREDIT: There will be no extra credit work accepted in this class.

INDEPENDENT STUDENT WORK

All assignments, Homework, and Midterm and Final exams **MUST** be the product of the student's individual efforts for this class.

COURSE GOALS

The primary goal of the Toxicology course is to develop an understanding of how the body's biochemical and physiological mechanisms operate to manage the exposure to toxins, poisons and drugs. The secondary goal is to develop an appreciation of how exposure to toxins and the processing of metabolites can limit the patient response to chiropractic care. To achieve these goals this course seeks to develop and expand the information literacy of students and their utilization of research in the

case management of patients. The course emphasizes an evidence-informed approach to the formulation of clinical decisions applied to the chiropractic management of patients.

TOXICOLOGY COURSE SCHEDULE

1st Week: Clinic Entrance and Competency Exams—No class meeting.

Assessment exam of previous material in basic science courses -- biochemistry, signal transduction, genetic transcription, nutrition, cell physiology, systemic physiology.

2nd Week: The instructor will present fundamental pharmacokinetic and pharmacodynamic topics of pharmacology and toxicology—efficacy, effectiveness, potency, biological half-life, bypass of 1st-pass hepatic metabolism, agonist/antagonist bioactivity, affinity and protein receptors, clearance, therapeutic index.

3rd Week: The instructor will present detoxification pathways and mechanisms—Cytochrome P450 enzyme system, induction, Biotransformation Phase I, Biotransformation Phase II, bioconjugating agents, drug-drug and drug-herb interactions, elimination pathways, and bioaccumulation.

4th Week: The instructor will present applications and examples in toxicology—acetaminophen, ethyl alcohol, polyaromatic hydrocarbons, induced deficiencies, genomic and metabolic impact. The instructor will lead a discussion in chiropractic and holistic perspective to managing toxic exposure.

5th Week: The instructor will present applications of pharmacology and toxicology—environmental toxins, metal toxicities, chelation chemistry and therapies. Instructor will post the take-home midterm exam to the Canvas site.

6th Week: Midterm Examination due. The instructor will present applications of pharmacology and toxicology—personal care products, phthalates, xenobiotics, nutritional supplementation and interactions, vitamins and minerals, and endocrine disruptors.

7th Week: The instructor will present pharmacological applications—hypoglycemic drugs, metformin, glitazones, and sulfonylureas. Instructor will lead discussion of holistic management of prediabetic state and metabolic syndrome.

8th Week: The instructor will present pharmacological applications—anxiolytic drugs, benzodiazepines, antidepressant drugs, SSRIs/SNRIs, MAOIs and serotonin syndrome.

9th Week: The instructor will present pharmacological applications—pain medications, NSAIDs, opioids, neurogenic analgesic drugs, salicylism, eicosanoid chemistry, cox-2 inhibitors, respiratory burst and inflammatory response.

10th Week: The instructor will present the anti-oxidation system—enzymes (catalase, SOD, Glutathione peroxidase), antioxidant vitamins, PUFAs and lipid peroxidation. Review and preparation for final exam.

11th Week: Final Exam.

Student Learning Outcomes

This course aligns to PLOs: (1 and 3)

Upon the successful conclusion of this course, the student should be able to

1. Understand and apply pharmacokinetic and pharmacodynamic principles that impact administration, absorption, distribution, metabolism, elimination, efficacy, potency, effectiveness and biological activity of drugs and toxins.
2. Understand and describe how the liver's cytochrome P₄₅₀ system works, including Biotransformation Phases I and II, and how drug-drug and drug-herb interactions affect this detoxification system.
3. Understand the therapeutic and adverse effects of selected drugs, supplements, and environmental toxins.
4. Understand and identify health conditions linked to selected toxic exposures from food, lifestyle, environment, workplace and home.
5. Understand the role of toxicology in the development and progression of disease and to characterize its impact on patient response to chiropractic care.

Program Learning Outcomes (PLO): Students graduating with a Doctor of Chiropractic degree will be proficient in the following:

- 1. ASSESSMENT AND DIAGNOSIS:** An assessment and diagnosis requires developed clinical reasoning skills. Clinical reasoning consists of data gathering and interpretation, hypothesis generation and testing, and critical evaluation of diagnostic strategies. It is a dynamic process that occurs before, during, and after the collection of data through history, physical examination, imaging, laboratory tests and case-related clinical services.
- 2. MANAGEMENT PLAN:** Management involves the development, implementation and documentation of a patient care plan for positively impacting a patient's health and well-being, including specific therapeutic goals and prognoses. It may include case follow-up, referral, and/or collaborative care.
- 3. HEALTH PROMOTION AND DISEASE PREVENTION:** Health promotion and disease prevention requires an understanding and application of epidemiological principles regarding the nature and identification of health issues in diverse populations and recognizes the impact of biological, chemical, behavioral, structural, psychosocial and environmental factors on general health.
- 4. COMMUNICATION AND RECORD KEEPING:** Effective communication includes

oral, written and nonverbal skills with appropriate sensitivity, clarity and control for a wide range of healthcare related activities, to include patient care, professional communication, health education, and record keeping and reporting.

5. **PROFESSIONAL ETHICS AND JURISPRUDENCE:** Professionals comply with the law and exhibit ethical behavior.
6. **INFORMATION AND TECHNOLOGY LITERACY:** Information literacy is a set of abilities, including the use of technology, to locate, evaluate and integrate research and other types of evidence to manage patient care.
7. **CHIROPRACTIC ADJUSTMENT/MANIPULATION:** Doctors of chiropractic employ the adjustment/manipulation to address joint and neurophysiologic dysfunction. The adjustment/manipulation is a precise procedure requiring the discrimination and identification of dysfunction, interpretation and application of clinical knowledge; and, the use of cognitive and psychomotor skills.
8. **INTERPROFESSIONAL EDUCATION:** Students have the knowledge, skills and values necessary to function as part of an inter-professional team to provide patient-centered collaborative care. Inter-professional teamwork may be demonstrated in didactic, clinical or simulated learning environments.
9. **BUSINESS:** Assessing personal skills and attributes, developing leadership skills, leveraging talents and strengths that provide an achievable expectation for graduate success. Adopting a systems-based approach to business operations. Networking with practitioners in associated fields with chiropractic, alternative medicine and allopathic medicine. Experiencing and acquiring the hard business skills required to open and operate an on-going business concern. Participating in practical, real time events that promote business building and quantifiable marketing research outcomes
10. **PHILOSOPHY:** Demonstrates an ability to incorporate a philosophically based Chiropractic paradigm in approach to patient care. Demonstrates an understanding of both traditional and contemporary Chiropractic philosophic concepts and principles. Demonstrates an understanding of the concepts of philosophy, science, and art in chiropractic principles and their importance to chiropractic practice.