Instructor: ……
Office #: ……
Office phone: ……
E-mail: ……

Office Hours:
……
……
……

Course description:

This course covers the major principles and concepts of toxicology. Furthermore, the course is organized into three main sections; the first one covers the general principles of toxicology that include explaining the terminology related to toxicology, classification of toxic agents, dose-response relationship and mechanisms of toxicity. The second section covers the disposition of toxicants that include absorption, distribution and excretion of toxicants. The last section of this course covers an overview of toxicant classes and discusses examples of selected nonorgan- and organ- directed toxicity such as chemical carcinogenesis, toxic responses of the liver, toxic responses of the nervous system and the endocrine system.

Aims of the course:

Overall aim of this course is to provide an introductory overview of the field of toxicology covering the basic principles and concepts of toxicology. In addition, the course aims to provide the students with the understanding of toxicant mechanisms, how toxicants are absorbed, distributed and excreted from the body. Furthermore, the students should be able to describe and explain how toxic agents cause damage to the body through understanding the examples and mechanisms that will be discussed in this course.

Intended Learning Outcomes: (ILOs)

A. Knowledge and Understanding

A1. Concepts and Theories:

- Understand basic toxicological principles
- Describe how toxic agents are taken up by, processed in and eliminated from the body
- List major classes of toxicant
- Describe the metabolic conversions of endogenous and xenobiotic chemicals to water-soluble compounds
- Understand how to use and apply modeling and mathematical description of disposition of xenobiotics
- Describe chemical carcinogens and explain their mechanism of action
- Describe toxic agents that cause damage to liver, nervous system and endocrine system and explain their mechanism of action in causing damage to these organs and apply that to other organs

A2. Contemporary Trends, Problems and Research:

- Explain recent methods that are used to assess the mechanisms the toxic agent works and how it cause harmful effect to human and other organisms
- Understand the scientific research that have been used to investigate the effect of different toxic agents on human

A3. Professional Responsibility:

- Apply the knowledge from this course for risk assessment of the toxicant while working in medical laboratory or in other medical fields occupations
- Apply quality control procedures in the lab to avoid the risk of exposing to chemical toxicants

B. Subject-specific skills

B1. Problem solving skills:

- Investigating and understanding the effect of different toxic agent on human health and the environment through scientific thinking and deep analysis
- Describe scientific procedure for solving problems in identifying and studying toxic agents through analyzing course example in toxicology research and answer questions through the lecture

B2. Modeling and Design:

- Gain the skills for modeling and mathematical description of the time course of disposition of xenobiotics in the whole body
- Apply these modeling skills in future researches that are related to toxicology field and other related medical fields

B3. Application of Methods and Tools:

- Understand different methods that are used to study how different toxic agents cause their harmful effect and the methods used to assess the risk of exposing to many toxicants
- Ability to apply the methods learned in this course in future research related to toxicology or other related fields

C. Critical-Thinking Skills

C1. Analytic skills:

- Gain familiarity with basic building blocks of toxicology, to enable the students to subsequently build a more detailed knowledge and analysis of those particular aspects of toxicology that interest them
- Ability to design and analyze experiments in the field of toxicology such as investigating the toxic effect of a particular toxicant on human or environment

C2. Strategic Thinking:

- Be able to use and apply the knowledge given in this course and the scientific research examples explained in this course to prepare future plans to minimize the risk of different toxic agents
- Ability to apply strategic thinking skills obtained from the course in other medical subjects and personal life

C3. Creative thinking and innovation:

- Use a wide range of idea based on their knowledge in this course to suggest research method related to toxicology and apply that on different scientific fields
- Be able to demonstrate accomplishment of discovery/innovation/creativity through producing/constructing creative works/new ideas, effective solutions to real-life problems or new processes
- Enhance students' creative and innovative thinking skills through "brainstorm" questions

D. General and Transferable Skills (other skills relevant to employability and personal development)

D1. Communication:

- Begin to develop intellectual independence and foster a commitment to lifelong learning
- Appreciate the need to communicate information and arguments effectively using written and oral skills

D2. Teamwork and Leadership:

- Develop team work skills through working in groups outside the lecture to solve homework given during the course

Course structures:

Week	Topic #	Topics	Chapter	Teaching Procedure	Assessment methods
1	-	**Introductory Lecture**	-	-	-
	1	**History of Toxicology**	1	Lecture, oral inquiry & charts	Class participation & discussion
2 3	2	**Principles of Toxicology** Different areas of toxicology General characteristics of toxic response Classification of toxic agents Characteristics of exposure Dose-response Variation in toxic responses	2	Lecture, oral inquiry & figures	Class participation, discussion & homework
4 5 6	3	**Mechanisms of Toxicity** Step 1: Delivery Step 2: Reaction of the ultimate toxicant with the target molecule Step 3: Cellular dysfunction and resultant toxicities Step 4: Repair or dysrepair	3	Lecture, oral inquiry & figures	Class participation, discussion & homework
	First Exam date: ……				
7 8	4	**Absorption, Distribution, & Excretion of Toxicant** Cell membrane Absorption Distribution Excretion	5	Lecture, oral inquiry & figures	Class participation, discussion & homework
9	5	**Biotransformation of Xenobiotics** General Principles Hydrolysis Reduction Oxidation Conjugation	6	Lecture, oral inquiry & figures	Class participation, discussion & homework
	6	**Toxicokinetics**	7	Lecture, oral inquiry & figures	Class participation & discussion
10	7	**Classes of Toxicants** Exposure classes (air pollutants, water and soil pollutants, occupational toxicants) Use classes (metals, agricultural chemicals, food additives, toxins, therapeutic drugs)	3 & 4 ***(Supp. Text Book #2)***	Lecture, oral inquiry & figures	Class participation, discussion & homework
11	8	**Chemical Carcinogenesis**	8	Lecture, oral inquiry & figures	Class participation & discussion
12	**Second Exam date: ……**				
	9	**Toxic Reponses of the Liver** Liver physiology Mechanisms and types of toxin-induced liver injury	13	Lecture, oral inquiry & figures	Class participation & discussion
13	10	**Toxic Reponses of the Nervous System** Overview of the nervous system Mechanism of neurotoxicity Chemicals that induce depression of nervous system function	16	Lecture, oral inquiry & figures	Class participation, discussion & homework
14	11	**Toxic Reponses of the Endocrine System**	21	Lecture, oral inquiry & figures	Class participation & discussion
15-16	**Final exams period, to be determined by the registration**				

References:

A. Main Textbook:

- ***Casarett & Doull's Essentials of Toxicology*** (3rd edition, 2015) by Curtis Klaassen and John B. Watkins III, *the McGraw-Hill Companies*
  - ✓ The second edition (2010) of this textbook is available in the university library's booking shelf

B. Supplementary Textbook(s) & Other Resources:

1. ***Casarett & Doull's Toxicology: The Basic Science of Poisons, Eighth Edition*** (8th edition, 2013) by Curtis Klaassen, *the McGraw-Hill Companies*
2. ***A Textbook of Modern Toxicology*** (4th edition, 2010) by Ernest Hodgson, *Wiley & Sons, Inc.*
3. **University Library:** the library in the university provides excellent electronic resources and databases that include research papers and book chapters. Please visit the university website/library page for more information.
   - ✓ For example, the **course main text book** is available on-line through the library's database: **Access Pharmacy**
4. **Internet:** there are many websites that provide valuable data related to toxicology including research paper, books, animation, etc. You can find more of these by searching in the internet using a suitable searching key. Many websites will be posted on moodle during the semester.
5. **NCBI database:** includes many textbooks that are available online FREE, and research articles related to different fields of toxicology.
6. **Lecture Handouts**

Moodle:

- Moodle provides all the necessary information related to this course including: course syllabus, announcements related to the course, lecture handouts, etc.
- **PLEASE MAKE SURE** to check moodle for any update related to the course or to download lecture's handouts.

Assessment Methods:

Methods	Grade	Date
First exam	23 %	…… (to be confirmed by the faculty)
Second exam	23 %	…… (to be confirmed by the faculty)
Participation and attendance	4 %	-
Final exam	50 %	To be determined by the registration