

**University of Jordan-Faculty of Pharmacy**  
**Department of Biopharmaceutics and Clinical Pharmacy**

**Semester:** First  
**Course Title:** Pharmacokinetics  
**Course Code:** 1203475  
**Prerequisite (s):** Biopharmaceutics (1203471)  
**Level:** 4<sup>th</sup> year

Coordinator	Office Number	Office Hours	E - mail
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### **Course description**

This course provides you with a basic intuitive understanding of the pharmacokinetic principles, terminology, models, equations and factors affecting drug absorption, distribution, metabolism and excretion and its importance in drug therapeutic or toxic effects. Emphasis will be placed upon the prediction of plasma levels of drugs under varying conditions applying different pharmacokinetic parameters. Solved examples obtained from literature and problem sets with answers are used to illustrate the application of pharmacokinetic principles and equations, making them realistic for clinical practice.

### **Course Objectives :**

- 1) Mathematical background for modeling of the concentration time relationships for the different routes of administration.
- 2) Designing dosing regimens by relating plasma concentration of drugs to their pharmacological and toxicological action,
- 3) Individualization of therapy for patients.
- 4) Designing therapeutic drug monitoring plans for drugs with narrow therapeutic index or high toxicity.

### **Learning Outcomes :**

#### **A) Knowledge and understanding**

- A1) Understanding mathematics of the time course of Absorption, Distribution, Metabolism, and Excretion (ADME) of drugs in the body.
- A2) Individualization of therapy and therapeutic drug monitoring for each patient.

#### **B) Intellectual skills (cognitive and analytical)**

- B1) Utilization of mathematics of the time course of Absorption, Distribution, Metabolism, and Excretion (ADME) of drugs in the body for dosage optimization.
- B2) Developing dosing regimens for the individualization of therapy for the patient

**C) Subject specific skills**

- C1) Fitting concentration time profiles and estimating pharmacokinetic parameters.
- C3) Designing dosing regimens in case of renal and hepatic dysfunction.

**D) Transferable Skills**

- D1) Communicating the dosage adjustment with physicians.
- D2) Suggesting therapeutic monitoring plans for physicians.

**Teaching Methods :**

- 1) Lectures
- 2) Case studies

**Exams :**

Midterm exam	40%
Quizzes and assignments	10%
Final exam	50%

**Course contents**

1. Introduction
2. The one-compartment open model with an intravenous bolus dose.  
Plasma data; elimination rate constant, AUC, elimination half-life, volume of distribution and clearance  
Urinary data; excretion rate constant and half-life, elimination rate constant
3. The one-compartment open model with an intravenous infusion. Continuous infusion, Infusion with a bolus dose, post infusion
4. The one-compartment open model with absorption and elimination; Absorption rate constant, calculation of F, method of residuals, flip-flop kinetics
5. The one-compartment open model with multiple dosing kinetics; Multiple dosing IV and oral, multiple dosing factor, accumulation factor, loading dose, and average concentration.
6. Designing dosing regimens
7. Dosage adjustment in renal failure. (Aminoglycosides)
8. The two-compartment open model with intravenous administration.
9. Non-linear pharmacokinetics  
Michaelis-Menten kinetics, methods to obtain  $V_{max}$  and  $K_m$  (Phenytoin).
10. Pharmacodynamics  
Linear models, E-max and time dependent response.
11. Therapeutic Drug Monitoring.
12. Bioequivalence revisited.

**Textbook**

Applied biopharmaceutics and pharmacokinetics, Shargel and Yu, 6<sup>th</sup> edition, 2012

## **References:**

### Basic Pharmacokinetics

- 1- Basic pharmacokinetics, Sunil Jambhekar, Philip J. Breen 1<sup>st</sup> edition 2009
- 2- Handbook of Basic Pharmacokinetics  
Wolfgang Ritschel, 6<sup>th</sup> edition, 2004
- 3- Clinical pharmacokinetics: concepts and applications  
Rowland and Tozer, 3<sup>rd</sup> edition, 1995

## **Useful Web Sites**

A First Course in Pharmacokinetics and Biopharmaceutics  
<http://www.boomer.org/c/p1/>