




Philadelphia University  
Faculty of Pharmacy  
First semester, 2021/2022

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QFA-PA-VA-008**

QFO-AP-VA-008	رمز النموذج :	اسم النموذج : خطة المادة الدراسية	 جامعة فيلادلفيا Philadelphia University
2	رقم الإصدار: (Rev)	الجهة المصدرة: نائب الرئيس للشؤون الأكاديمية	
2021-5-4	تاريخ الإصدار:	الجهة المدققة : اللجنة العليا لضمان الجودة	
4	عدد صفحات النموذج :		

<u>Course syllabus</u>	
Course title: Pharmaceutical Analytical Chemistry	Course code: 0510122
Course level: Second year	Prerequisites 0212109 and Co-requisite: Pharmaceutical biostatistics: 0250130
Lecture time: 11:15 AM-12:30 PM (S & T)	Credit hours: 3 (0510122)

<u>Academic Staff</u>				
<u>Specifics</u>				
Name	Rank	Office number and location	Office hours	E-mail address
Abdul Muttaleb Jaber	Professor	9-210	S & T 13:00-14:00	ajaber@philadelphia.edu.jo

**Course description (Catalogue description)**

**0510122 Pharmaceutical analytical chemistry (3 Credit hours)**

**Prerequisite (0212109) and Co-requisite (0250130)**

Stoichiometric calculations, principles of chemical equilibria, titrimetric and gravimetric analysis including: acids and bases and buffers, aqueous and non-aqueous acid-base titrations, precipitation titrations, complexometric titrations, oxidation reduction and potentiometric titrations and ion-selective electrodes, and principles of gravimetric analysis. Emphasis should be given to the pharmaceutical analysis applications.

## (0510122) كيمياء تحليلية صيدلانية (3 ساعات معتمدة)

متطلب سابق (0212109) ومتزامن مع (0250130)

تتناول هذا المادة التقنيات التحليلية التقليدية المستخدمة عادة في الصناعة الصيدلانية من خلال القاء الضوء على الحسابات الكيميائية ومبادئ التوازن الكيميائي والتحليل الوزني والتحليل الحجمي بما يتضمنه من معايرة الأحماض والقواعد في الأوساط المائية وغير المائية ومعايير الترسيب ومعايرة تكوين المعقدات ومعايير الأكسدة والاختزال والمعايير الجهدية. كما تتناول هذه المادة التحليل باستخدام الأقطاب الانتقائية. كما سيكون التركيز على تطبيقات مبادئ التحليل الكيميائي في المجالات الصيدلانية.

### **Course objectives**

- Introducing students to fundamental concepts of analytical chemistry with an emphasis on quantitative analysis.
- Discussing theories, concepts of experimental design, and data analysis as they apply to quantitative analysis
- Emphasizing the concepts of chemical equilibrium, and numerical calculations.
- Providing students with laboratory experience in the classical wet methods of analysis

### **Learning outcomes**

Upon completion of this course students will be able to:

#### **A: Knowledge**

- A1: Demonstrate a comprehensive knowledge of various methods of expressing concentration.
- A2: Conduct calculations relevant to wet methods (volumetric and gravimetric) of chemical analysis.
- A3: Demonstrate knowledge of the basic principles of titrimetric and gravimetric methods of chemical analysis.

#### **B: Skills**

- B1: Demonstrate technical skills used in the performance of wet methods of quantitative chemical analysis.
- B2: Make observations and assessments of important factors that could affect the wet methods of chemical analysis.
- B3: Demonstrate effective written and oral communication skills relevant methods of chemical analysis.
- B4: Access resources for analytical and pharmaceutical methods of analysis in both printed and electronic format.

#### **C: Competencies**

- C1: Identify the most appropriate titrimetric or gravimetric method of analysis to use for various samples.
- C2: Demonstrate skills in problem solving, critical thinking and analytical reasoning pertinent to the wet methods of chemical analysis.
- C3: Demonstrate the ability to integrate and interpret data and establish a course of action to solve problems.
- C4: Demonstrate the capability to apply safety in the performance of routine laboratory testing.

**Textbook/s:**

1. G. D. Christian, P.H. Dasgupta, and H. A. Shug, "Analytical Chemistry", Seventh edition, John Wiley, 2014
2. S. Hansen, S Pedersen-Bjergaard and K, Rasmussen, Introduction to Pharmaceutical Chemical Analysis, John Wiley, 2012.

**Teaching methods**

In-class lecturing where current topics are interrelated to the past and future topics. Numerical problems and experimental applications related to various types of titrimetric and gravimetric methods of analysis will be discussed.

**Assessment instruments**

- In-class quizzes and homework assignments
- One major exam and final exam

<b><u>Allocation of Marks</u></b>	
<b>Assessment Instruments</b>	<b>Mark</b>
Midterm Exam	<b>30</b>
Class grade	<b>30</b>
Final examination	<b>40</b>
Total	<b>100</b>

**Documentation and academic honesty**

- ***Documentation style (with illustrative examples)***

Whenever applicable, students should conduct their assignments themselves whether individually or in a group work referencing all information, data, figures and diagrams taken from literature. The references should be given according to the acceptable format.

- ***Protection by copyright***

Students should realize that some published information or data are the property of their authors and they are not allowed to use it without asking permission from the originators.

- ***Avoiding plagiarism.***

Plagiarism is the unauthorized use or close imitation of the language and thoughts of another author and the representation of them as one's own original work, without proper acknowledgment of the author or the source. Students must pursue their studies honestly and ethically in accordance with the academic regulations. Cheating in exams and plagiarism are totally unacceptable and those who, intentionally, commit such acts would be subjected for penalties according to the University regulations.

**Topical outline and tentative schedule**

1. All material to be covered is drawn from the Textbook (G. D. Christian, P.H. Dasgupta, and H. A. Shug, "Analytical Chemistry", Seventh edition, 2014) according to the chapter number and associated sections mentioned in the schedule given below.
2. Teaching methodology will be mainly in-class lecturing

3. Homework assignments will be given throughout the Philadelphia University Moodle Platform. Students should submit their homework assignments on the Moodle Platform.

### Expected workload

On average, students need to spend 2 hours of study and preparation for each 50-minute lecture/tutorial.

Week #/ Date/Chapter # /Lecture #	Topics to be covered	Chapter # and Section # to be covered weekly	Homework
Week #1: 17-21/10/21 Chapters 1 and 2 Lectures 1 & 2	Brief introduction: Analytical objectives and basic equipment in analytical laboratory	Handouts	
Week #2: 24-28/10/21 Chapter 5 Lectures 3 & 4	Stoichiometric Calculations: The Workhorse of the Analyst	5.1, 5.2, 5.3,5.4, 5.5	Selected questions will be assigned (Problems, p. 183-187)
Week #3: 31/10-4/11/2 Chapter 5 Lectures 5 & 6	Stoichiometric Calculations: The Workhorse of the Analyst	5.1, 5.2, 5.3,5.4, 5.5	Selected questions will be assigned (Problems, p. 183-187)
Week #4: 7-11/11/21 Chapter 5 Lectures 7 & 8	Stoichiometric Calculations: The Workhorse of the Analyst	5.1, 5.2, 5.3,5.4, 5.5	Selected questions will be assigned (Problems, p. 183-187)
Week #5: 14-18/11/21 Chapter 6 Lectures 9 & 10	General Concepts of Chemical Equilibrium	6.1, 6.2, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 6.10, 6.11, 6.12, 6.16, 6.17	Selected questions will be assigned (Problems, p. 219-220)
Week #6: 21-27/11/21 Chapter 6 Lectures 11 & 12	General Concepts of Chemical Equilibrium	6.1, 6.2, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 6.10, 6.11, 6.12, 6.16, 6.17	Selected questions will be assigned (Problems, p. 219-220)
Week #7: 28/11-04/12/21 Chapter 7 Lectures 13 & 14	Acid–Base Equilibria	7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9, 7.13, 7.14	Selected questions will be assigned (Problems, p. 275-277)
Week #8: 5-9/12/21 Chapter 7 Lectures 15 & 16	Acid–Base Equilibria	7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9, 7.13, 7.14	Selected questions will be assigned (Problems, p. 275-277)
Week #9: 12-16/21 Chapter 8 Lectures 17 & 18	Acid–Base Titrations	8.1, 8.3, 8.4, 8.5, 8.6, 8.7, 8.9, 8.12, 8.13	Selected questions will be assigned (Problems, p. 314-316)
<b>Week # 10</b>	<b>Second Exam. To be announced</b>	All material covered after the First Exam	
Week #10: 19-23/12/21 Chapter 9 Lectures 19 & 20	Complexometric Reactions and Titrations	9.1, 9.3, 9.4	Selected questions will be assigned (Problems 340-341)
Week #11: 26-30/12/21 Chapter 10 Lectures 21& 22	Gravimetric Analysis and Precipitation Equilibria	10.1, 10.2 (5.8), 10.3, 10.5	Selected questions will be assigned (Problems 363-365)
Week #12: 2-6/1/22 Chapter 11 Lectures 23 & 24	Precipitation Reactions and Titrations	11.4	Selected questions will be assigned (Problems p. 382)
Week #13: 9-13/1/22 Chapter 12 Lectures 25 & 26	Electrochemical Cells and Electrode Potentials	12.1, 12.2, 12.3	Selected questions will be assigned (Problems p. 396-397)
Week #14: 16-20/12/22 Chapter 14 Lectures 27 & 28	Redox and Potentiometric Titrations	14.1, 14.2, 14.4, 14.5, 14.6, 14.7	Selected questions will be assigned (Problems p. 464-465)
Week #15: 23-27/1/22 Chapter 14 Lectures 29 & 30	Redox and Potentiometric Titrations	14.1, 14.2, 14.4, 14.5, 14.6, 14.7	Selected questions will be assigned (Problems p. 464-465)
Week #16: 30/1-3/2/22 <b>Final Exam</b>	<b>To be announced</b>		

### **Attendance policy**

Absence from lectures and/or tutorials shall not exceed 15%. Students who exceed the 15% limit without a medical or emergency excuse acceptable to and approved by the Dean of the relevant college/faculty shall not be allowed to take the final examination and shall receive a mark of zero for the course. If the excuse is approved by the Dean, the student shall be considered to have withdrawn from the course.

### **References**

#### **Books**

- (Harris, Daniel C. and Harris, Hopkins, *Quantitative Chemical Analysis*, 6th Edition, W H Freeman & Co, 2010.
- Skoog, Douglas A.; West, Donald M.; Holler, F. James, *Fundamentals of Analytical Chemistry*, 7th Edition, Brooks Cole, 1995
- Quantitative Chemical Analysis, Daniel C. Harris (1982) W.H. Freeman, N.Y.

#### **Websites**

Some websites are mentioned in the textbook at the end of each chapter. Other sites will be given during the classes and may be given as assignments to the students.

#### **Assessment of the learning outcomes**

All the expected outcomes of the course mentioned above are directly related to each of the topics planned to be covered and shall be assessed based on quizzes, the two major exams, the final exam and the homework assignments. The targeted performance in all of the stated learning outcomes is expected to be 60-95% of the total course grade.

#### **Description of the tools used to assess the learning outcomes**

1. The quizzes will be mainly subjective questions (short-answer essay, extended-response essay, and problem solving). These quizzes will cover the material taught during one to two weeks.
2. The First major exam will cover the material taught from the beginning of the semester up to the exam date. The second major exam will cover the material taught after the first exam up to the date of the exam. The final exam will cover the course material with more emphasis on the topics taught after the second exam. The questions will objective (multiple-choice, true-false, matching and completion) and subjective questions.
3. The homework assignments will be selected from the problems given the Textbook after each chapter. The assignments will be communicated to students through the Moodle Platform.