



Course Specification

(Bachelor)

Course Title: Pharmaceutical Analytical Chemistry-1

Course Code: PHCH 213

Program: Pharmaceutical Sciences

Department: Pharmaceutical Chemistry

College: Pharmacy

Institution: Najran University

Version: 3

Last Revision Date: 18/11/2024

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A. General information about the course:

1. Course Identification

1. Credit hours: 3 (2+1)

2. Course type

A. ☐ University ☐ College ☐ Department ☐ Track ☒ Program
B. ☒ Required ☐ Elective

3. Level/year at which this course is offered: (4th Level / 2nd year)

4. Course general Description:

This course focuses on various principles of basic and pharmaceutical analytical chemistry that are used for quantitative analysis of substances. This includes the fundamentals of all types of volumetric analysis such as acid-base, precipitometry, complexometry and redox titrations and their applications

5. Pre-requirements for this course (if any):

None

6. Co-requisites for this course (if any):

None

7. Course Main Objective(s):

- 1- Explain the principles and fundamentals of the quantitative volumetric analysis of substances such as acid-base, precipitometry, complexometry and redox titrations
- 2- Applications of the volumetric analysis of pharmaceutical compounds and minerals
- 3- Apply the volumetric titrations professionally

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> Traditional classroom E-learning 		
4	Distance learning		



3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	30
3.	Field	0
4.	Tutorial	0
5.	Others (specify)	0
Total		60

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	Knowledge and understanding			
1.1	Describe the fundamentals of acid-base, precipitometry, complexometry and redox titrations and their applications	K3	Lectures	Written exam Assignments
2.0	Skills			
2.1	Plan strategies for the solution of analytical problems	S1	Lectures Problem-based learning	Written exam
2.2	Demonstrate practical skills of preparation of standards and results interpretation	S3	Laboratory work Problem-based learning	Practical exam
2.3	Communicate clearly by verbal and written means using chemical terms	S5	Laboratory work	Reports Assignment
3.0	Values, autonomy, and responsibility			
3.1	Demonstrate effective and reasonable solutions for rising problems based on the	V4	Practical sessions	Observation cards



Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	available information, accountability, confidence, and independent thinking			

C. Course Content (theoretical)

No	List of Topics	Contact Hours
	<u>Quantitative volumetric analysis (Titrations)</u>	
1.	<ol style="list-style-type: none"> Requirements of the reactions suitable for titration Standard solutions and their preparations Sources of errors in volumetric titrations Theories of acids and bases pH of acids, bases and salts Buffer solutions; types, composition, preparation and their importance Acid-base indicators Titration curves Applications of acid-base titrations <ol style="list-style-type: none"> Direct acid-base analysis of strong acids and bases Direct acid-base analysis of Na_2CO_3 and boric acid Double indicator titration Back titrations; requirements and examples Analysis of mixtures of 2 substances 	10
2.	<u>Precipitometry</u> <ol style="list-style-type: none"> Fundamentals of precipitometric titrations. Methods for detection of the end point Applications of precipitometric titrations <ol style="list-style-type: none"> Mohr's method Volhard's method Fajan method and adsorption indicators 	6
3.	<u>Complexometry</u> <ol style="list-style-type: none"> Fundamentals of complexometric titrations Metallochromic indicators and complexon reagents Application of complexometric EDTA titrations and how to increase EDTA selectivity <ul style="list-style-type: none"> Masking and demasking 	6
4.	<u>REDOX titrations</u> <ol style="list-style-type: none"> Fundamentals of oxidation-reduction titrations Oxidation-reduction indicators and titration curves Redox reagents and their applications Application of redox systems in biological systems <ul style="list-style-type: none"> Iodine Involving titrations 	8
Total		30

Course Content (Practical)





No	List of Topics	Contact Hours (P)
1.	Lab 1. Safety introduction and fundamentals of the titration	2
2.	Lab 2 Determination of pH of solutions and buffers	2
3.	Lab 3. Acid-base titration (0.1N HCl \neq NaOH)	2
4.	Lab 4 Acid-base titration (0.1N HCl \neq CO ₃ ²⁻)	2
5.	Lab 5 Acid-base titration (0.1N Acetic acid \neq NaOH)	2
6.	Lab 6 Mohr's method	3
7.	Lab 7 Volhard's method	3
8.	Lab 8 Complexometric titration of Ca ²⁺ by EDTA	3
9.	Lab 9 Complexometric titration of Mg ²⁺ by EDTA	3
10.	Lab 10 Redox titration of ferrous sulphate by KMnO ₄	2
11.	Lab 11 Redox titration of H ₂ O ₂	
12.	Revision	2
13.	Final practical exam on week number 14	2
Total		30

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	5	10
2.	Midterm	7-9	20
3.	Assignment	12	5
4.	Observation card	2-13	10
5.	Practical reports or Practical quiz	12	5
6.	Final Practical exam	16	10
7.	Final theoretical exam	17-19	40
8.	Total		100

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	1. Vogel's Quantitative chemical Analysis, 7th Edition, 2009 2. Analytical Chemistry by Christian, G.D. 7th Edition, John Wiley and Sons: New York, 2014.
Supportive References	1. Vogel's Quantitative chemical Analysis, 7th Edition, 2009 2. Power point slides



Electronic Materials

www.dlaf.nu.edu.sa

Other Learning Materials

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Suitable lecture room equipped with data show and internet and sufficient number of seats. Suitable laboratories equipped with health and safety tools, internet and sufficient number of seats.
Technology equipment (projector, smart board, software)	Computers, data show, sound systems and internet
Other equipment (depending on the nature of the specialty)	1. Volumetric flasks of different volumes 2. Conical flasks 3. Burets 4. Water bath 5. Hot plates 6. pH meters

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Head of departments and students	Indirect Questionnaires (indirect)
Effectiveness of Students assessment	Faculty members and students	Indirect Questionnaires (indirect)
Quality of learning resources	Students	Questionnaires (Indirect)
The extent to which CLOs have been achieved	Student peer reviewer	Direct Indirect
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Pharmaceutical Chemistry Department Council
REFERENCE NO.	4-2024
DATE	18/11/2024