



Course Specification

(Bachelor)

Course Title : Instrumental Analysis of Pharmaceutical Compounds

Course Code: PHCH 519

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: (10th Level / 5th year)

4. Course general Description:

This course focuses on describing and explaining theoretical background and principles that are used for quantitative instrumental analysis of substances including fundamentals of different methodologies such as photoluminescence, atomic spectroscopy, electrochemistry, gas chromatography and mass spectroscopy in combination with HPLC and GC as well as their instrumentation and applications

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

PHCH 518

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

None

7. Course Main Objective(s):

7. Course Main Objective(s)

- 1- Explain the main principles and fundamentals of the quantitative instrumental analysis of substances such as chromatography, Photoluminescence, atomic spectroscopy, and electrochemistry
- 2- Apply the different types of analysis professionally
- 3- Demonstrate practical skills for preparation of standards and operating instruments

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 		





No	Mode of Instruction	Contact Hours	Percentage
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 theoretical background and principles underlying quantitative instrumental analysis of chemical compounds	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	Evaluate scientific and professional literature critically to be utilized in evidence-based practice and conducting research.	S2	Group discussion	Assignments
2.3	Demonstrate practical skills of preparation	S3	Laboratory work Problem-based learning	Practical exam





Code	Course Learning Outcomes	Code of PLOs aligned with program	Teaching Strategies	Assessment Methods
	standards and results interpretation			
2.4	Communicate clearly by verbal and written means using chemical terms.	S5	Laboratory work	Reports
3.0	Values, autonomy, and responsibility			
3.1	Demonstrate effective and reasonable solutions for rising problems based on the available information, accountability, confidence, and independent thinking.	V4	Practice sessions	Observation cards

C. Course Content (Theoretical)

No	List of Topics	Contact Hours
1.	<u>Luminescence spectroscopy</u> 1- Theory of fluorescence, phosphorescence and chemoluminescence 2- Factors affecting fluorescence and phosphorescence 3- Relation between fluorescence and molecular structure 4- Bases of quantitation 5- Applications	6
2.	<u>Flame emission spectroscopy (FES)</u> 1. Fundamentals of light absorption by atoms 2. Factors affecting flame emission 3. Linear relationship for quantitative analysis 4. Instrumentation of flame photometry 5. Application of flame photometry in pharmaceutical analysis	4
3.	<u>Atomic absorption spectroscopy (AAS),</u> 1. Theory and instrumentation, 2. Application of AAS in the pharmaceutical analysis 3. Interferences in AAS and flame photometry 4. High energy excitation sources: Plasma and laser	4
4.	<u>Gas Chromatography (GC)</u> a- Definitions of all parts of GC (Instrumentation) b- Modes of separation analysis by using GC c- GC detectors d- Pyrolysis GC	4





	e- Qualitative and quantitative analysis by using GC. f- Chromatographic parameters of GC analysis	
5.	Mass spectrometry (MS) a. Theory of MS b. Mass interpretation of MS spectrum and structural elucidation c. Application of MS in pharmaceutical analysis d. Mass fragmentation pattern	5
6.	Electrochemical methods a- Introduction for electrochemistry and electrochemical cells b- Comparing galvanic and electrolytic cells and their uses. c- Potentiometry and types of electrodes d- Application of potentiometry. e- Fundamentals and types of voltammetry f- Polarography: theory, instrumentation and applications g- Conductometry: Fundamentals and instrumentation h- Conductometric titrations in pharmaceuticals	7
Total		30

Course Content (Practical)

No	List of Topics	Contact Hours
1.	1- Lab 1 Introduction to laboratory health and safety procedures and tools names 2- Lab 2 Determination of Na ⁺ ions by flame 3- Lab 3. Determination of Pb ²⁺ ions by AAS 4- Lab 4. Determination of quinine by FS 5- Lab 5. Determination of acetic acid conductance 6- Lab 6. GC Determination of methanol and ethanol 7- Lab 7. Determination of paracetamol using MS 8- Lab 8. Interpretation of MS spectra 9- Lab 9. Data Analysis using excel software 10- Lab 10. Statistics in laboratory 11- Revision 12- Final practical exam on week number 14	30
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 exam	7-9	20





No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
3.	Assignment	12	5
4.	Practical quiz or practical reports	12	5
5.	Observation card	2-13	10
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	<ol style="list-style-type: none"> 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	<ul style="list-style-type: none"> • Analytical Chemistry by Christian, G.D. 7th Edition, John Wiley and Sons: New York, 2014 • Power point slides
Electronic Materials	http://www.dlaf.nu.edu.sa/
Other Learning Materials	Excel software for calculations and drawing

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)	<ol style="list-style-type: none"> 1. Volumetric flasks of different volumes 2. Water bath 3. Hot plates 4. Automatic pipettes 5. Ultrasonic instrument 6. pH meters 7. Atomic absorption spectrometer 8. Flame photometer 9. Fluorescence spectrophotometer 10. HPLC-MS instrument 11. GC instruments



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

