Course Specifications

Course Title:	**Forensic Chemistry**
Course Code:	**4024586-2**
Program:	**Chemistry**
Department:	**Chemistry**
College:	**Applied Science**
Institution:	**Umm Al-Qura University**

Table of Contents

A. Course Identification

1. Credit hours: 2 hrs (Theoretical).
2. Course type **a.** University ☐ College ☐ Department ■ Others ☐ **b.** Required ■ Elective ☐
3. Level/year at which this course is offered: 7th level /4th year
4. Pre-requisites for this course (if any)**:** **Separation methods and thermal analysis (4023562-3)**
5. Co-requisites for this course (if any)**: -----**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	2	100%
2	**Blended**	---	---
3	**E-learning**	---	---
4	**Correspondence**	---	---
5	**Other**	---	---

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	28
2	**Laboratory/Studio**	---
3	**Tutorial**	6
4	**Others** (specify)	---
	Total	34
Other Learning Hours*		
1	**Study**	---
2	**Assignments**	2
3	**Library**	6
4	**Projects/Research Essays/Theses**	4
5	**Others** (specify)	---
	Total	12

***** The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

B. Course Objectives and Learning Outcomes

1. Course Description

This course will provide an introduction to forensic chemistry and prepare students to build a sound knowledge in chemical, biochemical, and instrumental methods for forensic analysis and statistical analysis of forensic data. The class will cover principles and applications of chemical, biochemical, spectroscopic, and chromatographic methods for analysis and characterization of forensic samples. Potential topics include forensic applications of UV-Visible, IR, Raman, NMR, atomic absorption (AA) spectroscopy, fluorescence microscopy, X-ray, mass spectrometry; chromatographic methods (GC, HPLC, and TLC). Also, its covers chemistry in examination and analysis of chemical, biological, and physical forensic samples (alcohol, carbon monoxide, papers, hair, gunpowder, inks, fibers, paints, firearms, fingerprint, palmprint, documents, and body fluid and blood samples); crime lab services; forensic statistics; introduction to international forensic databases.

2. Course Main Objective

- ✓ To provide a general overview of the prevalent chemical principles, methods, and instrumentation involved in the analysis of physical evidence.
- ✓ To emphasize instruction and experience in the most commonly employed chemical and instrumental methods of forensic analysis.
- ✓ To provide the student a background in statistical analysis of data.
- ✓ To describe basic instrumentation used in forensics analysis and the principles behind their function.
- ✓ To familiarize the student with the methodologies involved in analysing forensic samples including: fingerprints, hair, Forgery of Banknotes, documents.
- ✓ To emphasize the importance of sound science and ethics in the analysis of forensic evidence and in the reporting of the findings of such analyses.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge:**	
1.1	Differentiate between quality assurance - quality control - quality management - Internal quality control - External quality control.	K1, K5, K7
1.2	Know the science of forensic chemistry.	K1
1.3	Explain how to take a representative sample for analysis and the associated problems during sample preparation	K1
1.4	Understand how spectroscopic and analytical methods are used to analyze forensic samples.	K6
1.5	Mention instrumentation used in forensics analysis and the principles behind their function	K6
2	**Skills :**	
2.1	Discuss statistical analysis of data	S3, S7, S2
2.2	Compare the different analytical methods used in forensics analysis	S8
2.3	Plan to make research program in forensic according to systematic steps	S8
3	**Competence:**	
3.1	Discuss the quality in chemical analysis.	C3
3.2	Choose the suitable analytical device to analyse real samples in forensic chemistry	C1

CLOs		Aligned PLOs
3.3	Conclude the importance of analytical chemistry in studying forensic chemistry	C4

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to forensic chemistry	2
2	The quality in chemical analysis - quality assurance - quality control - quality management - Internal quality control - External quality control	2
3	Statistics used in analysing the results	4
4	Sample preparation, representative sampling techniques, reproducibility, replicates, duplicates, external standard, internal standard and matrix effect.	2
5	The most important analytical devices used in the chemical analysis process to analyse the ambiguity of the crime scene in forensic Chemistry	2
6	Mid Term exam	2
7	Video Comparative spectrum device, A highly efficient liquid chromatography, atomic absorption spectrometry, Ultraviolet and visible spectrometer ,)	2
8	Infrared device, Automated fingerprint system - Genetic Analysis System- Light microscopes	2
9	Analysis of Forensic Samples - Drug Analysis - Inks, Paints, Pigments, Blood Alcohol Analysis	2
10	Applications of analytical chemistry in the hair analysis - fingerprinting - forgery of banknotes and documents	2
11	The use of analytical chemistry in the analysis of toxins (drug analysis) - Chemical - abusive drugs	4
12	Revisions and preparatory exam	2
Total		28

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge**		
1.1	Know the science of forensic chemistry.	• Lectures • Scientific discussion • Library visits • Web-based study	• Exams • web-based student performance systems • portfolios • long and short essays • posters lab manuals
1.2	Differentiate between quality assurance - quality control - quality management - Internal quality control - External quality control.		
1.3	Explain how to take a representative sample for analysis and the associated problems during sample preparation.		
1.4	Understand how spectroscopic and analytical methods are used to analyze forensic samples.		

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.5	Mention instrumentation used in forensics analysis and the principles behind their function		
2.0	**Skills**		
2.1	Discuss statistical analysis of data	1. Group discussions 2. Case study. 3. Homework assignment containing problem 4. Thinking activities	1.Midterm exam 2.quizzes 3.Group discussion 4.Final exam
2.2	Compare the different analytical methods used in forensics analysis		
2.3	Plan to make research program in forensic according to systematic steps		
3.0	**Competence**		
3.1	Discuss the quality in chemical analysis.	1. Group discussions 2. Case study. 3. Data presentation 4. Thinking activities	1.Midterm exam 2.Quizzes 3.Group discussion 4.Final exam
3.2	Choose the suitable analytical device to analyse real samples in forensic chemistry		
3.3	Conclude the importance of analytical chemistry in studying forensic chemistry		

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework or activities.	--	10 %
2	First Periodic Exam.	6	20 %
3	Second Periodic Exam.	12	20 %
4	Final Exam. (2h exam)	16	50 %
5	**Total**	**100 %**	

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :

- We have faculty members to provide counselling and academic advice.
- 2 hours per week as office hours are available for discussion with the students.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• 1- Ho, M. H. Analytical Methods in Forensic Chemistry, Ellis Horwood, Ltd., London, 1990. • 2- Saferstein, R. Criminalistics; An Introduction to Forensic Science, 5th Ed., Prentice-Hall, Inc., NY, 1994. • 3- Tebbett, I., Ed., Gas Chromatography in Forensic Science, Ellis Horwood, Ltd., London, 1993.

	• 4- Lowry, W. T. Forensic Toxicology: Controlled Substances and Dangerous Drugs, Plenum Publ. Co., NY, 1979. • 5- Yinon, J., Ed., Forensic Applications of Mass Spectrometry (Modern Mass Spectrometry), CRC Press, Boca Raton, FL, 1995. • 6- Jay A. Siegel, Forensic Chemistry: Fundamentals and Applications, Wiley & Sons, 2015. • Lawrence Kobilinsky, Forensic Chemistry Handbook, Wiley & Sons, 2012.
Essential References Materials	• Lecture Handouts available on the coordinator website
Electronic Materials	• http://en.wikipedia.org/wiki/Petroleum1/ • http://www.chemhelper.com/ • http://www.chemweb.com/ • http://www.science.uwaterloo.ca/~cchieh/cact/ • http://www.sciencedirect.com/
Other Learning Materials	• Microsoft Power Point, Excel and Microsoft Word • Sigma Plot • Quatitative analysis video • Teaching CD for qualitative analysis

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• Classrooms capacity (30) students. • Providing hall of teaching aids including computers and projector.
Technology Resources (AV, data show, Smart Board, software, etc.)	• Room equipped with computer and projector and TV
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	-------

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Program Leaders	Direct
Extent of achievement of course learning outcomes	Peer Reviewer	Direct
Quality of learning resources	Students	Direct

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	

Reference No.	
Date	

Received by: Dr. Ismail Althagafi **Department Head**

Signature: **Date: 20/12/2019**