Course Specifications

Course Title:	**Separation Methods and Thermal Analysis**
Course Code:	**4023562-3**
Program:	**Chemistry**
Department:	**Chemistry**
College:	**Faculty of Applied Science**
Institution:	**Umm Al-qura University**

Table of Contents

A. Course Identification

1. Credit hours:	**3 hrs** (2 theoretical + 1 practical)
2. Course type	
a.	University ☐ College ☐ Department ■ Others ☐
b.	Required ■ Elective ☐
3. Level/year at which this course is offered:	**6th level/3rd year**
4. Pre-requisites for this course (if any)**:**	**Spectrophotometric and Electrochemical techniques (4023555-3)**
5. Co-requisites for this course (if any)**:**	------

منسّق:الخط: ١٢ نقطة، خط اللغة العربية وغيرها: ١٢ نقطة

منسّق:الخط: ١٢ نقطة، خط اللغة العربية وغيرها: ١٢ نقطة

منسّق:الخط: (افتراضي Roman weN semiT، ١٢ نقطة، لون الخط: أسود، خط اللغة العربية وغيرها: Roman weN semiT، ١٢ نقطة، (العربية وغيرها) العربية (المملكة العربية السعودية)

6. Mode of Instruction (mark all that apply)

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

جدول منسّق

7. Actual Learning Hours (based on academic semester)

No	Activity	Learning Hours
Contact Hours		
1	**Lecture**	30
2	**Laboratory/Studio**	~~36~~42
3	**Tutorial**	--
4	**Others** (specify)	--
	Total	~~66~~72
Other Learning Hours*		
1	**Study**	30
2	**Assignments**	18
3	**Library**	10
4	**Projects/Research Essays/Theses**	---
5	**Others** (specify)	---
	Total	58

منسّق:متوسط

منسّق:متوسط

منسّق:متوسط

منسّق:متوسط

منسّق:متوسط

منسّق:متوسط

منسّق:متوسط

منسّق:متوسط

منسّق:متوسط

منسّق:متوسط

منسّق:متوسط

***** 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

منسّق:الخط: دون غامق، خط اللغة العربية وغيرها: دون غامق
منسّق:الخط: دون غامق، خط اللغة العربية وغيرها: دون غامق
منسّق:مضبوطة، المسافة البادئة: السطر الأول: 87.0 سم
منسّق:الخط: دون غامق، خط اللغة العربية وغيرها: دون غامق
منسّق:الخط: دون غامق، خط اللغة العربية وغيرها: دون غامق
منسّق:الخط: دون غامق، خط اللغة العربية وغيرها: دون غامق
منسّق:الخط: دون غامق، خط اللغة العربية وغيرها: دون غامق
منسّق:الخط: دون غامق، خط اللغة العربية وغيرها: دون غامق

B. Course Objectives and Learning Outcomes

1. Course Description

This course explores the fundamental basis of separation methods and thermal analysis. It is designed to give the student a solid conceptual background and hands-on practice to understand how analytical techniques can be used to separate the mixtures; including their limits and advantages. The emphasis is on mixture analysis and the course covers basic different chromatographic devices and concepts, and thermal analysis. ~~The students will be mentioned to prepare an essay or a report from literature using the library, data base services, and/or websites to follow up and update the new topics of the subject of the course~~

2. Course Main Objective

By the end of this course the students will

1- **Have all information about mixtures in chemistry**
2- **Familiar with separation process and methods of thermal analysis.**
3- **Able to use many separation tools for separate both organic and in organic mixtures.**
4- **Compare between the calometric analysis and thermal titrations**

~~**By the end of this course student have all information about the instrumental analysis and have ability to determine the trace amounts of different compounds and metals.**~~

منسّق: المسافة البادئة: قبل: 72.1 سم
منسّق:الخط: ١١ نقطة، غامق، خط اللغة العربية وغيرها: ١١ نقطة، غامق

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge:**	
1.1	Recognize the separation methods in analytical chemistry, classifications , and solvent extraction technique	K1 &K2
1.2	Identify the principles of chromatographic methods and its classification	K5
1.3	Know the principles of column chromatography	K1
1.4	Describe liquid-liquid chromatography and Solid-liquid chromatography	K1
1.5	Familiar with plane chromatography	K4
1.6	Select the proper method of preparation of an organic molecule	K5
1.7	Name the different conformations of alkanes and cycloalkanes	K1
1.8	Determine principles and devices of previous analysis methods	K5
1.9	Recognize thin layer chromatography (TLC), paper chromatography (PC) and electrophoresis method	K1
2	**Skills :**	
2.1	Apply separation methods in analytical chemistry	S2
2.2	Compare calometric analysis and thermal titrations	S1 & S2
2.3	Explain the principles of chromatographic methods and its classification	S1
2.4	Analyze liquid-liquid chromatography and Solid-liquid chromatography	S2
2.5	Summarize the principles and devices of GC and HPLC	S2
3	**Competence:**	
3.1	Ability to work in a team to perform a specific experimental tasks.	C1
3.2	Ability to work independently to handle chemicals	C1
3.3	Ability to communicate results of work to classmate and participation in class or lab oratory discussions.	C3
3.4	Encourage students to use internet for searching certain electronic journals regarding topics of the course.	C3
3.5	Scientific writing and use his/her observations to solve problems.	C2
3.6	Doing research and conduct searches for restoring information.	C3

CLOs		Aligned PLOs
3.7	Able to calculate and discuss the facts and logical propose methods to solve the difficulties.	C4

C. Course Content

No	List of Topics	Contact Hours
1	Separation methods in analytical chemistry, classifications , and solvent extraction technique	4
2	Principles of chromatographic methods and its classification	2
3	Column chromatography	2
4	Liquid-liquid chromatography and Solid-liquid chromatography	2
5	Ion exchanger chromatography, ionic chromatography and HPLC	2
6	Plane chromatography	2
7	Thin layer chromatography (TLC), paper chromatography (PC) and electrophoresis method	2
8	Gas chromatography	4
9	Gas chromatography in qualitative, quantitative, medical and petroleum analysis	2
10	Principles and devices of previous analysis methods	2
11	Thermal analysis methods: thermo gravimetric analysis (TGA), (DTG), (DSC) and (DTA)	2
12	Calometric analysis and thermal titrations	2
Total		28

Labortory Part:

- **Solvent extraction of iodine from aqueous layer to organic layer.**
- **Choosing suitable solvent for separation mixture of inks or amino acids using paper chromatography.**
- **Halides separation using thin layer chromatography.**
- **Determination of total concentration of cations in water sample using ion-exchange chromatography.**
- **Using GC to determine retention time, flow rate and internal standard solution then determine pentanol in unknown sample.**
- **Chemical equilibrium measurement using GC for the reaction of methyl acetate with ethyl alcohol.**
- **Determination fatty acid by GC.**
- **Determination of alcohol by GC.**
- **Determination of benzoic acid in beverages by GC.**
- **Determination of drugs in pharmaceuticals using HPLC.**

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	Recognize the separation methods in analytical chemistry, classifications , and solvent extraction technique	Lectures and Library visits	Quiz
1.2	Identify the principles of chromatographic methods and its classification	Lectures and Library visits	Quiz

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.3	Know the principles of column chromatography	Lectures and Library visits	Exam
1.4	Describe liquid-liquid chromatography and Solid-liquid chromatography	~~Lectures and~~Lectures and Scientific discussion	Exam
1.5	Familiar with plane chromatography	Scientific discussion	long and short essays
1.6	Familiar with plane chromatography	Scientific discussion Web-based study	Exam
1.7	Name the different conformations of alkanes and cycloalkanes	Scientific discussion Web-based study	Exam
1.8	Determine principles and devices of previous analysis methods	Scientific discussion Web-based study	Exam
1.9	Recognize thin layer chromatography (TLC), paper chromatography (PC) and electrophoresis method	Lectures and Library visits	long and short essays
1.10	Memorize the thermal analysis methods	Lectures and Library visits	Exam
1.11	Outline calometric analysis	Scientific discussion	Exam
1.12	Define thermal titrations	Lectures and Library visits	Exam
2.0	**Skills**		
2.1	Apply separation methods in analytical chemistry	Lectures	Laboratory demonstration
2.2	Compare calometric analysis and thermal titrations	Scientific discussion	Essays
2.3	Explain the principles of chromatographic methods and its classification	Scientific discussion and Lectures	Exam
2.4	Analyze liquid-liquid chromatography and Solid-liquid chromatography	Lectures	Laboratory demonstration
2.5	Summarize the principles and devices of GC and HPLC	Scientific discussion and Lectures	Exam
3.0	**Competence**		
3.1	Ability to work in a team to perform a specific experimental tasks.	Class discussion and research activity	Laboratory demonstration
3.2	Ability to work independently to handle chemicals		Performance on in-practical exams.
3.3	Ability to communicate results of work to classmate and participation in class or lab oratory discussions.	Class discussion and research activity	Overall student performance in Lab.
3.4	Encourage students to use internet for searching certain electronic journals regarding topics of the course.	Lecture, library visit, web-based study	Laboratory demonstration
3.5	Scientific writing and use his/her observations to solve problems.	Lecture	Cross questions after finishing laboratory work
3.6	Doing research and conduct searches for restoring information.	Lecture, library visit, web-based study	Essay
3.7	Able to calculate and discuss the facts and logical propose methods to solve the difficulties.	Class discussion and research activity	Cross questions after finishing laboratory work

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework or activities.	--	10 %
2	Midterm Exam.	8	20 %
3	Practical Exam.	14	30 %
4	Final Exam. (2hours Exam)	16	40 %
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 counseling and advice.**
- **Office hours: During the working hours weekly.**
- **Academic Advising for students.**

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	• Gary D. Christian, Purnendu K. Dasgupta and Kevin A. Schug, ***Analytical Chemistry***, 7th edition, WILEY (2014) • Douglas A. Skoog, Donald M. West, James F. Holler and Stanley R. Crouch, ***Analytical Chemistry***, 7th edition, Springer (2014) • Dhruba Charan Dash. *Analytical Chemistry* (2017) PHI Learning Private Limited.
Essential References Materials	Lecture Hand outs available on the coordinator website
Electronic Materials	• **http://www.chemweb.com** • **http://www.sciencedirect.com** • **http://www.rsc.org**
Other Learning Materials	

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	• **No other requirements.**

Item	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	Peer Reviewer	Direct
Extent of achievement of course learning outcomes	Program Leaders	Direct
Quality of learning resources	Students	Indirect

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	31/10/2019

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

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