



Course Specifications

Course Title:	Chromatographic Separation Methods
Course Code:	2043104-3
Program:	Bachelor in Chemistry
Department:	Department of Chemistry
College:	College of Sciences
Institution:	Taif University

Table of Contents

A. Course Identification	3
6. Mode of Instruction (mark all that apply)	3
B. Course Objectives and Learning Outcomes	3
1. Course Description	3
2. Course Main Objective.....	3
3. Course Learning Outcomes	3
C. Course Content	4
D. Teaching and Assessment	4
1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods	5
2. Assessment Tasks for Students	5
E. Student Academic Counseling and Support	5
F. Learning Resources and Facilities	5
1. Learning Resources	5
2. Facilities Required.....	6
G. Course Quality Evaluation	6
H. Specification Approval Data	6

A. Course Identification

1. Credit hours: 3 (2 Theoretical, 1 Lab)
2. Course type
a. University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b. Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
3. Level/year at which this course is offered: 10 th Level/ 4 th Year
4. Pre-requisites for this course (if any): Chemistry of Volumetric and Gravimetric Analysis (2042104-3)
5. Co-requisites for this course (if any): NA

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3 Theoretical and 2 Practical hours/ Week	100 %
2	Blended	-	-
3	E-learning	-	-
4	Distance learning	-	-
5	Other	-	-

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	30
2	Laboratory/Studio	20
3	Tutorial	-
4	Others (specify)	-
	Total	50

B. Course Objectives and Learning Outcomes

1. Course Description

This course designed to give an extensive knowledge of Chromatography separation science including adsorption chromatography, planar chromatography, gas Chromatography, high performance liquid chromatography and capillary electrophoresis ion exchange chromatography.

2. Course Main Objective

The course aims to define separation science before and after chromatography, principles, theories, classifications, types, and applications in different fields.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	Knowledge and Understanding:	
1.1	Outline the principles of separation science and chromatographic analysis	K1
1.2	Recognize applications of chromatographic analysis in separation and identification of unknown compounds in industry	K3
2	Skills:	
2.1	Explain the chromatographic separation methods to identify and	S1

CLOs		Aligned PLOs
	quantify the separated compounds theoretically and practically	
2.2	Utilize the concept of chromatographic analysis in environmental issues	S3
3	Values:	
3.1	Illustrate the concept of teamwork	V1

C. Course Content

No	List of Topics	Contact Hours
1	Introduction on separation before and after chromatography: Theory and importance of extraction, distillation, freezing standard methods	3
2	Definition and types of chromatography (planar, column, gel, zone and capillary electrophoresis and affinity chromatography).	3
3	Principles, theory, mechanisms, aim and general instrumentation.	3
4	Classification of chromatographic techniques: Adsorption chromatography; Partition chromatography; Ion exchange chromatography; Pore penetration chromatography	3
5	Planar chromatography (Paper chromatography and Thin layer chromatography).	3
6	Column chromatography and Affinity chromatography.	3
7	Column efficiency through Plate theory (Van Deemter equation).	3
8	Gas Chromatography and it's applications: Sampling; Instrumentation; Mobil phase, Injectors, column types, stationary phase and detectors applications	3
9	High performance liquid chromatography and it's applications: Instrumentation; Mobil phase, column types, stationary phase and detectors applications	3
10	Capillary electrophoresis Ion Exchange Chromatography: Theory and applications.	3
Total		30

Lab Content

No	List of Topics	Contact Hours
1	Laboratory safety guidelines, lab reports and lab facilities.	2
2	Separation of inks by paper chromatography.	2
3	Separation of amino acids by paper chromatography.	2
4	Paper Chromatography of a Metal cation Mixture.	2
5	Determination of the exchange capacity of a cation ion-exchange resin (Column Method)-Part I.	2
6	Determination of the exchange capacity of a cation ion-exchange resin (Column Method)- Part II.	2
7	Separation of chloride and bromide on an anion exchanger.	2
8	Determination of extraction percentage of iodine from water phase-Part I.	2
9	Determination of extraction percentage of iodine from water phase-Part II.	2
10	Writing scientific reports using modern computer technology.	2
Total		20

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 and Understanding		
1.1	Outline the principles of separation science and chromatographic analysis	Lecture	Written Exam
1.2	Recognize applications of chromatographic analysis in separation and identification of unknown compounds in industry	Lecture	Written Exam
2.0	Skills		
2.1	Explain the chromatographic separation methods to identify and quantify the separated compounds theoretically and practically	Discussion	Homework Assignments
2.2	Utilize the concept of chromatographic analysis in environmental issues	Problem-Solving	Practical tasks and Exam
3.0	Values		
3.1	Illustrate the concept of teamwork.	Collaborative Learning	Individual presentations

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Homework Assignments	Throughout Semester	5%
2	Individual presentations	Throughout Semester	5%
3	Mid Term Exam	6	20%
4	Practical tasks	Throughout Semester	25%
5	Final practical Exam	10/11	5%
6	Final exam	11/12	40%

*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:

Commitment to the rules of the Academic Advising Department at the university in accordance with the academic guidance manual approved by the university and the attached forms, there are different arrangements made by teaching staff to support student consultations including;

- Office hours: 8 hours per a week for each academic member.
- Academic guidance: an academic member has a number of students to guide them throughout degree journey.

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	<ul style="list-style-type: none">Analytical Chemistry, Gary D. Christian, Purnendu K. Dasgupta, Kevin A. Schug (2013), Latest Edition. John Wiley & Sons Inc. (USA). ISBN: 978-0-470-88757-8. https://tinyurl.com/mt422bnw
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	<ul style="list-style-type: none"> • Ion Chromatography, James S. Fritz, Douglas T. Gjerde (2009). Wiley-VCH (USA), Latest Edition. ISBN-13: 978-3527320523. https://tinyurl.com/2p9mhkk6
Essential References Materials	<ul style="list-style-type: none"> • Principles of Instrumental Analysis, Douglas A. Skoog, F. James Holler, Stanley R. Crouch (2017). Cengage Learning (USA), Latest Edition. ISBN: 9781337468039. https://tinyurl.com/2p88hran
Electronic Materials	<ul style="list-style-type: none"> • Saudi Digital Library (SDL) https://apps.tu.edu.sa/sdl/default.aspx
Other Learning Materials	<ul style="list-style-type: none"> • Learning Management System (Blackboard) https://lms.tu.edu.sa/

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	<ul style="list-style-type: none"> • Lecture hall with 100 seats. • Equipped Lab with essential instrumentations.
Technology Resources (AV, data show, Smart Board, software, etc.)	<ul style="list-style-type: none"> • Computer and data show with Wi-Fi access.
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	<ul style="list-style-type: none"> • Paper chromatography tools. • Glassware for column chromatography. • Modern chromatography instruments.

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of Teaching and assessment	Students	Survey (indirect method)
Extent of achievement of course learning outcomes	Program leader	Reports (Direct method)
Quality of learning resources	Peer referees Students	Reports (Direct method) Survey (indirect method)

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	Department Council/ Quality assurance committee
Reference No.	2-5-1444
Date	01/11/2022