

## COURSE SPECIFICATIONS

Form

Course Title: **Chromatography**

Course Code: **4026845-3**



Date: 25-10-2018

Institution: Umm Al-Qura University.

College: Faculty of Applied Science

Department: Department of Chemistry

### A. Course Identification and General Information

1. Course title and code: **Chromatography / 4026845-3**

2. Credit hours: **3 hrs. (Theoretical)**

3. Program(s) in which the course is offered. **M. Sc. in Chemistry**

4. Name of faculty member responsible for the course: **Dr. Mohammed Ahmed Kassem**

5. Level/year at which this course is offered: **3<sup>rd</sup> / 2<sup>nd</sup>**

6. Pre-requisites for this course (if any): **not applicable**

7. Co-requisites for this course (if any): **not applicable**

8. Location if not on main campus: **El-Abedyah, El-Azizya, and El-Zaher**

9. Mode of Instruction (mark all that apply):

- |                                     |                                     |             |                                      |
|-------------------------------------|-------------------------------------|-------------|--------------------------------------|
| a. Traditional classroom            | <input type="checkbox"/>            | percentage? | <input type="checkbox"/>             |
| b. Blended (traditional and online) | <input checked="" type="checkbox"/> | percentage? | <input type="checkbox" value="80%"/> |
| c. E-learning                       | <input checked="" type="checkbox"/> | percentage? | <input type="checkbox" value="20%"/> |
| d. Correspondence                   | <input type="checkbox"/>            | percentage? | <input type="checkbox"/>             |
| f. Other                            | <input type="checkbox"/>            | percentage? | <input type="checkbox"/>             |

Comments:

## B Objectives

### 1. The main objective of this course

By the end of this course, students able to:

- a- Understand theoretical basis of separation by high performance liquid chromatography.
- b- Recognize the mechanism of separation for the different chromatographic systems.
- c- Learn about a direct connection of column liquid chromatography with spectral methods.

2. Describe briefly any plans for developing and improving the course that are being implemented. (e.g. increased use of the IT or online reference material, changes in content as a result of new research in the field)

- Encourage students to carry out research reports in the course subjects using the library, data base services, and/or websites.
- Changes in content as a result of new research in the field.
- The use of smart teaching halls for lectures.
- Increased use of IT or web based reference material.

**C. Course Description** (Note: General description in the form used in the program's bulletin or handbook)

### Course Description:

### 1. Topics to be Covered

List of Topics	No. of Weeks	Contact hours
- Theoretical basis of separation by high performance liquid chromatography (HPLC) or gas chromatography (GC) (properties and selection of stationary and mobile phases).	2	6
- The mechanism of separation for the different chromatographic systems Instrumentation in liquid chromatography and gas chromatography.	2	6
- Detection in liquid chromatography (ultra performance liquid chromatography).	1	3
- A direct connection of column liquid chromatography with spectral methods, derivatization of the analytes, enantio-selective separation.	2	6

- Theoretical basis of separation by electromigration separation methods.	1	3
- The electrophoretic migration and electroosmotic flow instrumentation for capillary electrophoresis.	1	3
- Capillary zone electrophoresis and capillary gel electrophoresis.	2	6
- Capillary isotachopheresis.	1	3
- Capillary isoelectric focusing analytical applications.	1	3
- HPLC and GC applications	1	3

## 2. Course components (total contact and credit hours per semester):

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	39	---	---	---	---	39
	Actual	3	---	---	---	---	3
Credit	Planned	39	---	---	---	---	39
	Actual	3	---	---	---	---	3

## 3. Individual study/learning hours expected for students per week.

2 Hrs.

## 4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategies

On the table below are the five NQF Learning Domains, numbered in the left column.

**First**, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and targeted learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy should fit in together with the rest to form an integrated learning and teaching process. (Courses are not required to include learning outcomes from each domain.)

### Curriculum Map

Code #	NQF Learning Domains And Course Learning Outcomes	Course Teaching Strategies	Course Assessment Methods
1.0	Knowledge		

1.1	Identify the mechanism of separation for the different chromatographic systems.	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Scientific discussion</li> <li>• Use the library to work duties and a small research on Chromatography.</li> <li>• Use of the internet to carry out some reports on course subjects.</li> </ul>	<ul style="list-style-type: none"> <li>• Written mid-term and final exams.</li> <li>• Long and short essays.</li> </ul>
1.2	Outline the instrumentation for capillary electrophoresis capillary zone electrophoresis.		
1.3	Write about the properties and selection of stationary and mobile phases.		
1.4	Understand the theoretical basis of separation by high performance liquid chromatography.		
1.5	Explain direct connection of column liquid chromatography with spectral methods.		
1.6	Describe the electrophoretic migration and electroosmotic flow.		
1.7	Recording the relation between capillary zone electrophoresis and capillary gel electrophoresis.		
1.8	Compare between capillary isotachophoresis and capillary isoelectric focusing analytical applications.		
<b>2.0</b>	<b>Cognitive Skills</b>		
2.1	Modify the capillary isoelectric focusing its analytical applications.	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Scientific discussion</li> <li>• Library visits</li> <li>• Web-based study</li> <li>• Using brain storming at the beginning of each lecture in order to stimulate the students towards the new topic of the course.</li> <li>• Enhancing open discussion during</li> </ul>	<ul style="list-style-type: none"> <li>• Mid-term and final exams.Measuring the response to the assignments.</li> <li>• Through assignments and homework</li> </ul>
2.2	Formulate the relation between the electrophoretic migration and electroosmotic flow.		
2.3	Apply a capillary zone electrophoresis and capillary gel electrophoresis.		
2.4	Interpret the mechanism of separation for the different chromatographic systems.		
2.5	Discover the theoretical basis of separation by high performance liquid chromatography.		

		the lecture.	
<b>3.0</b>	<b>Interpersonal Skills &amp; Responsibility</b>		
3.1	Operate in team work and accept his college's opinions.	<ul style="list-style-type: none"> <li>• Dividing students into groups to carry out collective scientific reports.</li> <li>• Periodic individual duties to develop the skill of taking responsibility and self-reliance.</li> </ul>	<ul style="list-style-type: none"> <li>• Evaluate the results of collective works and duties as well as knowing the contribution of each individual through dialogue and discussion.</li> <li>• Assessment of individual tasks and duties to determine the student's ability to self-reliance.</li> </ul>
3.2	Choose the suitable method to solve problems.		
3.3	Develop the student's ability in self-reliance and responsibility.		
<b>4.0</b>	<b>Communication, Information Technology, Numerical</b>		
4.1	Use computers and the international information network (the Internet) to perform calculations and to identify recent research relevant to decision sources.	<ul style="list-style-type: none"> <li>• Visiting research centers.</li> <li>• The use of computers in the training room of the department.</li> <li>• Using the internet for collecting data.</li> </ul>	<ul style="list-style-type: none"> <li>• Evaluation of the duties associated with the proper use of numerical and communication skills.</li> <li>• Web-based student performance systems.</li> <li>• Individual and group presentations.</li> </ul>
4.2	Communicate effectively in oral and written forms.		
4.3	Use basic mathematical and statistical techniques to perform data analysis.		
<b>5.0</b>	<b>Psychomotor(if any)</b>		
5.1	Not applicable.		

<b>5. Assessment Task Schedule for Students During the Semester</b>			
	<b>Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)</b>	<b>Week Due</b>	<b>Proportion of Total Assessment</b>
1	Assignments and activities.	--	10 %
2	Midterm Exam.	8	30 %
3	Final Exam.	15-16	60 %
4	<b>Total</b>		<b>100 %</b>

#### **D. Student Academic Counseling and Support**

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic counseling. (include the time teaching staff are expected to be available per week)
  - Office hours: During the working hours weekly.
  - Academic advising for students.
  - Availability of Staff members to provide counseling and advice.

#### **E Learning Resources**

1. List Required Textbooks
  - Chromatography: Principles and Instrumentation, Mark F. Vitha, Wiley, 2016.
  - Hydrophilic Interaction Chromatography, MARK F. VITHA, John Wiley & Sons, Inc., publication, 2013.
2. List Essential References Materials (Journals, Reports, etc.)
  - McCalley DV. Evaluation of the properties of a superficially porous silica stationary phase in hydrophilic interaction chromatography. J. Chromatogr. A 2008; 1193: 85–91.
  - Wu J, Bicker W, Lindner W. Separation properties of novel and commercial polar stationary phases in hydrophilic interaction and reversed-phase liquid chromatography mode. J. Sep. Sci. 2008; 31: 1492–1503.
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
  - Planar Chromatography- Mass Spectrometry. Teresa Kowalska, CRC Press, 2015.
  - Sunil K Dubey, Anil Patni, Arshad Khuroo, Nageshwar R. Thudi, Simrit Reyar, Arun Kumar, Manoj S Tomar, Rakesh Jain, Nand Kumar and Tausif Monif, E-Journal of Chemistry, 2009.
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.
  - <http://nsdl.niscair.res.in/jspui/>
  - <http://www.chemistry.uoc.gr/>
  - <http://www.chemie.uni-hamburg.de/>

#### **F. Facilities Required**

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access, etc.)

1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)

<ul style="list-style-type: none"><li>Equipped lecture hall equipped specializing in chromatography.</li></ul>
2. <b>Technology</b> resources (AV, data show, Smart Board, software, etc.) <ul style="list-style-type: none"><li>Room equipped with computers, data show and TV.</li></ul>
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) No other requirements.

## G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching <ul style="list-style-type: none"><li>Structured group discussions and/or focus groups.</li><li>Questionnaires can be used to collect student feedback.</li><li>Student representation on staff-student committees and institutional bodies.</li></ul>
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department <ul style="list-style-type: none"><li>The instructor's statement of his/her goals for the course, teaching methods and philosophy, student outcomes, and plans for improvement are a critical source of information.</li><li>A systematic self-review has the potential for contributing significantly to the instructor's teaching improvement by focusing on the strengths and weaknesses of the course in light of his/her original course objectives.</li><li>Colleagues have the expertise to evaluate the quality of a course as evidenced by its content and format (peer reviewers).</li></ul>
3. Procedures for Teaching Development <ul style="list-style-type: none"><li>Providing new tools for learning.</li><li>The application of e-learning.</li><li>Exchange of experiences internal and external.</li><li>Training programs and workshops for Staff member.</li></ul>
4. Procedures for Verifying Standards of Student's Achievement (e.g. check marking by an independent member teaching staff of a sample of student's work, periodic exchange and remarking of tests or a sample of assignments with staff members at another institution) <ul style="list-style-type: none"><li>Check marking by an independent member teaching staff of a sample of student work.</li><li>Periodic exchange and remarking of tests or a sample of assignments with staff at another institution.</li></ul>
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. <ul style="list-style-type: none"><li>Workshops for teachers of the course.</li><li>Periodic review of the contents of the syllabus and modify the negatives.</li><li>Hosting a visiting staff to evaluate of the course.</li></ul>

**Name of Course Instructor: Dr. Mohammed Ahmed Kassem**

**Signature:**  **Date Completed: 25 – 10 - 2018**

**Program Coordinator: Dr. Ismail Ibrahim Althagafi**

**Signature:**  **Date Received: 26/10/2018**

