

## COURSE SPECIFICATIONS

### Form

Course Title: **Advanced Polymer Chemistry**

Course Code: **4026835-3**



Date: 21-10-2018

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: **Advanced Polymer Chemistry / 4026835-3**

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

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

(If general elective available in many programs indicate this rather than list programs)

4. Name of faculty member responsible for the course: **Dr. Essam M. Hussein**

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?	80%
c. E-learning	<input checked="" type="checkbox"/>	percentage?	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

**This course aimed to:**

- Having critical insight in the different methods to prepare polymers.
- Being able to discuss relationships between different polymerization methods.
- Knowing of parameters that control the polymerization reactions.
- Getting acquainted with methods to build up complex polymer architectures.
- Being open for new scientific developments within the rapidly developing area of polymer chemistry.

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)

- Increased use of IT or web based reference material.
- Encourage students to carry out research reports in the field of this course 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.

**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
Polymer morphology	1	3
Living polymerizations	1	3
Controlled radical polymerizations: ATRP, NMP and RAFT	1	3
Step-reaction polymerization (poly-condensation reactions)	1	3
Dendrimers and hyperbranched polymers	1	3
Copolymers (random, block and graft): definitions and syntheses	1	3

Biodegradation of polymers	1	3
Most efficient chemical transformations of synthetic and natural polymers (eg. 'click' chemistry)	1	3
Polymers from renewable resources	1	3
Determination absolute molecular weights	1	3
Self-healing polymer materials	1	3
Polymeric capsules	1	3
Recent developments in polymer chemistry	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	39	--	--	--	--	39
Credit	Planned	3	--	--	--	--	3
	Actual	3	--	--	--	--	3

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

2

## 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	<b>Knowledge</b>		
1.1	Identify the basic principles of polymer morphology	<ul style="list-style-type: none"> <li>Lectures</li> <li>Scientific</li> </ul>	<ul style="list-style-type: none"> <li>Exams</li> <li>web-based student</li> </ul>

1.2	identify different methods to determine the absolute molecular weight of polymers	<p>discussion</p> <ul style="list-style-type: none"> <li>• Web-based study</li> <li>• Library visits</li> </ul>	<p>performance systems</p> <ul style="list-style-type: none"> <li>• portfolios</li> <li>• long and short essays</li> <li>• posters</li> </ul>
1.3	Recognize the different methods used in controlled radical polymerizations		
1.4	Write the products of polymerization reaction correctly		
1.5	Recognize the different types of polymers		
1.6	Determine the mechanism of polymerization reactions		
1.7	Familiar with the basic knowledge about the biodegradable polymers		
1.8	Familiar with the basic knowledge about the importance and applications of polymers in industry		
1.9	Familiar with the basic knowledge about the chemical transformations of synthetic and natural polymers		
1.10	Recognize the recent developments in polymer chemistry		
<b>2.0</b>	<b>Cognitive Skills</b>		
2.1	Explain the polymers morphology.	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Scientific discussion</li> <li>• Web-based study</li> <li>• Library visits</li> </ul>	<ul style="list-style-type: none"> <li>• Exams</li> <li>• web-based student performance systems</li> <li>• portfolios</li> <li>• long and short essays</li> <li>• posters</li> </ul>
2.2	Compare between the different methods of polymerization.		
2.3	Explain the reaction mechanisms for different polymerization reactions.		
2.4	Summarize the different methods used to synthesis of different types of polymers and		

	copolymers.		• demonstrations
2.5	Predict the future applications of polymeric materials (self-healing and capsules).		
2.6	Explain the physical properties of different polymeric materials.		
<b>3.0</b>	<b>Interpersonal Skills &amp; Responsibility</b>		
3.1	Use the basic knowledge of organic chemistry to synthesis of different types of polymers.	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Scientific discussion</li> <li>• Web-based study</li> </ul>	<ul style="list-style-type: none"> <li>• Exams</li> <li>• web-based student performance systems</li> </ul>
3.2	Determine the absolute molecular weight of polymer molecules.		
3.3	Choose the suitable mechanism for a given polymerization reaction.		
<b>4.0</b>	<b>Communication, Information Technology, Numerical</b>		
4.1	Evaluate the different modern methods to synthesis of polymeric materials.	<ul style="list-style-type: none"> <li>• Lectures</li> <li>• Scientific discussion</li> <li>• Library visits</li> <li>• Web-based study</li> </ul>	<ul style="list-style-type: none"> <li>• Web-based student performance systems</li> <li>• Individual and group presentations</li> </ul>
4.2	Demonstrate a synthetic pathways for synthesis of polymer molecules.		
4.3	Demonstrate the different applications of polymeric materials in industry.		
<b>5.0</b>	<b>Psychomotor(if any)</b>		
5.1	Not applicable		
5.2			

<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	Mid-term exam	8	30%
2	Assignments and activities		10%
3	Final Exam	15-16	60%

## 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)

- We have faculty members to provide counseling and advice.
- Office hours: During the working hours weekly.
- Academic Advising for students.

## E Learning Resources

1. List Required Textbooks

- C. E. Carraher, Polymer chemistry-revised and expanded, 6th Edition, Marcel Dekker, Inc. New York, 2003.
- I. M. Ward and J. Sweeney, An Introduction to The Mechanical Properties of Solid Polymers, 2nd Edition, Wiley, 2004. (TA455.P58 W36 2004).

2. List Essential References Materials (Journals, Reports, etc.)

- Lecture handouts available on the coordinator website.
- L. H. Sperling, Introduction to Physical Polymer Science, 4th Edition, Wiley, 2006.

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.

- <http://www.chemweb.com>
- <http://www.sciencedirect.com>
- <http://www.rsc.org>

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.

- [ChemDraw Ultra 11.0](#)

## 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.)

- Classrooms capacity (10) students.
- Providing hall of teaching aids including computers and projector.

2. **Technology** resources (AV, data show, Smart Board, software, etc.)

- Room equipped with computer, projector and TV.

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**

- Student representation on staff-student committees and institutional bodies.
- Questionnaires can be used to collect student feedback.

**2. Other Strategies for Evaluation of Teaching by the Instructor or the Department**

- Independent evaluation for extent to achieve students the standards.
- Independent advice of the duties and tasks.

**3. Procedures for Teaching Development**

- Workshops for teaching methods.
- Providing new tools for learning.
- The application of e-learning.
- Exchange of experiences internal and external.

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)

- Check marking of a sample of exam papers, or student work.
- Exchange corrected sample of assignments or exam basis with another staff member for the same course in other faculty.

5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.

- Consult other staff of the course.
- Hosting a visiting staff to evaluate of the course.
- Workshops for teachers of the course.

**Name of Course Instructor: Dr. Essam M. Hussein**

Signature:



Date Completed: 21 – 10 - 2018

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

Signature:



Date Received: 22/10/2018

