4. Learning and Teaching

4/1 Learning Outcomes and GraduateSpecifications

4/1/1 Main tracksor specializations covered by the program:

(a) Organic Chemistry.

(b) Inorganic Chemistry.

(c) Physical Chemistry.

(d) Analytical Chemistry.

4/1/2 Curriculum Study Plan Table

Level	Course Code	Course Title	Required or Elective	Prerequisite Courses	Credit Hours
Level 1 (12 Required Credit Hours)	402811-3	Organic reaction mechanism	Required	---	3
	402812-3	Statistical thermodynamics	Required	---	3
	402813-3	Advanced organometallic chemistry	Required	---	3
	402814-3	Statistical analytical chemistry	Required	---	3
Level 2 (12 Required Credit Hours)	402821-3	Modern techniques in organic spectroscopy	Required	---	3
	402822-3	Quantum chemistry	Required	---	3
	402823-3	Solid state chemistry	Required	---	3
	402824-3	Separation and method validation	Required	---	3
Level 3 (3 Required Credit Hours + 9 Elective Credit Hours)	402831-3	Research methods and seminar	Required	---	3
	402832-3	Advanced organic synthesis	Elective	---	3
	402833-3	Advanced heterocyclic chemistry	Elective	---	3
	402834-3	Photochemistry	Elective	---	3
	402835-3	Advanced polymer chemistry	Elective	---	3
	402836-3	Advanced chemical kinetics	Elective	---	3
	402837-3	Advanced surface and catalysis chemistry	Elective	---	3
	402838-3	Advanced electrochemistry	Elective	---	3
	402839-3	Physical chemistry of polymers	Elective	---	3
	402840-3	Advanced molecular spectroscopy	Elective	---	3
	402841-3	Mechanism of inorganic reactions	Elective	---	3
	402842-3	Spectroscopy and magnetism of inorganic compounds	Elective	---	3
	402843-3	Bioinorganic chemistry	Elective	---	3
	402844-3	Electroanalytical chemistry	Elective	---	3
	402845-3	Chromatography	Elective	---	3
	402846-3	Environmental chemistry	Elective	---	3
	402847-3	Chemometrics and data analysis	Elective	---	3
	402849-3	Nanomaterials and hybrid materials	Elective	---	3
	402850-3	Water treatments and purifications	Elective	---	3

	402851-3	Renewable energy	Elective	---	3
	402852-3	Nuclear chemistry	Elective	---	3
Level 4	402848-6	Research project	Required	---	6

4/1/3 Field or Research Components of the Study Plan

4/1/3/1 Summary of Practical or Medical Clinical Fellowship Components Required by the Program (if any):

a) Brief Description of Field Experience:

- Not applicable.

b) Program Level (s) of Field Experience:

- Not applicable.

c) Contact Hours of Field Experience and Time Table (Day / Week / Semester)

- Not applicable.

d) Field Experience Credit Hours:

- Not applicable.

4/1/3/2 Requirements of Research Project or Scientific Thesis (if any):

a) Brief Description of Research Project or Scientific Thesis Requirements.

- Before beginning of the research project, student should achieve 30 credit hours of the provided master courses at least.
- The student conducts research on chosen subject in the field of chemistry. The student participates in the research group of the supervising staff member, and contributes to ongoing research of the research group, by carrying out his research work, and writing a scientific researchdissertation.

b) Outline of Targeted Learning Outcomes of Research Project or Scientific Thesis.

- Students gain more in depth knowledge of the specific field of study that they choose for their project subject.
- They will be able to explain the principles and basics of quality in professional practice in the field of specialty.
- They can remember the legal and moral principles of professional practice in chemistry field.
- They also learn new methods of research and statistical techniques to investigate their ideas.

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Organic Reaction Mechanism**

Course Code: **402811-3**

Date: 26-10-2018	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: **Organic Reaction Mechanism / 402811-3**
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: **1st / 1st**
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		percentage?	
b. Blended (traditional and online)		percentage?	80%
c. E-learning		percentage?	20%
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

The aim of this course is to get a critical insight in the mechanism of different organic reactions.

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 field of organic reaction mechanisms 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
The mechanism of Arndt-Eistert synthesis, Reimer-Tiemann reaction, Vilsmeier-Hacc reaction.	3	9
The mechanism of Curtius reaction, JappKlingmann reaction, Tishchenko Reaction.	3	9
Redox reactions: the mechanism of Swern oxidation, Bayer-Villiger oxidation, Oppenawer oxidation, Meerwein-Ponndorf-Verley reduction, Saegusa-Ito oxidation.	2	6
Formation of C-C bond via coupling reactions: the mechanism of Heck coupling, Suzuki reaction, Sonogashira coupling.	2	6

Reactions approach heterocycles: the mechanism of Corey-Chaykovsky reaction, Hoch-Campbell Aziridine Synthesis, Barton-Zard Reaction, BuchererCarbazole Synthesis, Fischer Indole Synthesis, Fisher Oxazole Synthesis, Gewaldreaction, Friedlander Quinoline Synthesis, Biginelli Reaction.	3	9

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	**Knowledge**		
1.1	Identify the mechanism of different classes of organic reactions.	• Lectures • Scientific discussion • Web-based study • Library visits	• Exams • web-based student performance systems • portfolios • long and short essays
1.2	Understand the mechanism of different organic reactions.		
1.3	Know the different methods used in the		

	preparation of various organic compounds.		• posters
1.4	Recognize the mechanism of modern organic reactions.		
1.5	Familiar with the basic knowledge about the mechanism of named organic reactions.		
1.6	Determine the type of mechanism and intermediates in different organic reactions.		
2.0	**Cognitive Skills**		
2.1	Compare different types of organic reactions.	• Lectures • Scientific discussion • Web-based study • Library visits	• Exams • web-based student performance systems • portfolios • long and short essays • posters • demonstrations
2.2	Design of different strategies for preparation of different classes of organic compounds.		
2.3	Predict the products of different organic reactions.		
2.4	Summarize the mechanism of various organic reactions.		
2.5	Compare between the mechanisms of different organic reactions.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Use the basic knowledge of organic chemistry to suppose the organic reaction mechanism.	• Lectures • Scientific discussion • Web-based study	• Exams • web-based student performance systems
3.2	Determine the mechanism of different organic reactions.		
3.3	Choose the suitable mechanism for a given organic reaction.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Evaluate the importance of different organic reactions.	• Lectures • Scientific discussion • Library visits • Web-based study	• Web-based student performance systems • individual and group presentations
4.2	Demonstrate a synthetic pathways for synthesis of different classes of organic compounds.		
4.3	Demonstrate the mechanism of different organic reactions.		

4.4	Evaluate the different methods to synthesis of various organic compounds.		
4.5	Evaluate the importance of different organic reactions.		
5.0	**Psychomotor(if any)**		
5.1	Not applicable		
5.2			

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
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

1. Jie-Jack Li “Name reactions in heterocyclic chemistry” 2005, John Wiley & Sons. Inc. USA.
2. Subrata Sen Gupta “Reaction Mechanisms in Organic Chemistry” 1st ed., 2016 Oxford University Press.
3. John McMurry's "Organic Chemistry, 8th edition, International Edition" 2011, Brooks/Cole.

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

1. Lecture handouts available on the coordinator website.

2. Martin Oestreich "The Mizoroki-Heck reaction" 2009, John Wiley & Sons. Ltd.
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. • http://www.organic-chemistry.org/reactions.htm • 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 • Questionnaires can be used to collect student feedback. • Student representation on staff-student committees and institutional bodies.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • Observations and the assistance of colleagues. • 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. • Continuous training of member staff. • Review of strategies proposed. • 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. • Periodic Review of the contents of the syllabus and modify the negatives. • 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: 26 – 10 - 2018**

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

Signature: _____ **Date Received:** **27/10/2018**

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Statistical Thermodynamics**.

Course Code: **402812-3**

Date: 22-10-2018	**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: **Statistical Thermodynamics / 402812-3**
2. Credit hours: **3 (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. Ahmad Fawzy**
5. Level/year at which this course is offered: **1st / 1st**
6. Pre-requisites for this course (if any):--
7. Co-requisites for this course (if any):--
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		percentage?	
b. Blended (traditional and online)	perce		90
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		ercentage?	10

Comments:

B Objectives

1. The main objective of this course

By the end of this course students will be familiar with:

a. Application of basic concepts of statistical thermodynamics.
b. Derivation of partition functions for simple and complicated systems.
c. Application of the various statistical distribution functions on systems.
d. Knowledge of thermodynamical concepts and the application on a broad variety ofthermodynamical systems.

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)

- Updating the course content with the techniques that will be recently introduced in the field.
- The use of smart teaching halls for lectures.
- Increased use of IT or web based reference material.
- Encourage students to carry out research reports in the subjects using the library, data base services, and/or websites.

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
• Introduction.	1	3
• Different types of ensembles, ensemble averaging, distribution law (Boltzmann statistics	2	6
• Partition function and thermodynamic parameters; relation between molecular and molar partition functions, translational partition function.	2	6
• Rotational partition function for linear and non-linear molecules; vibrational partition function, electronic partition function.	2	6
• Midterm exam	1	
• Reference state of zero energy for evaluating partition function, equilibrium constant in terms of partition function.	2	6
• Application of statistical thermodynamics: equipartition theorem, heat capacity, behaviour of crystals.	2	6
• Introduction to quantum statistics: Distribution law for fermions (Fermi-Dirac statistics) and for bosons (Bose-Einstein statistics).	2	6
• Revision	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. Individualstudy/learning hours expected for students per week.

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	Demonstrate a systematic understanding of fundamental statistical thermodynamics principles.	• Use of the internet to carry out some reports on course subjects. • Lectures • Discussion groups • Seminar • In class problems	• Written assignments • Presentations • Formal mid-term and final exams.
1.2	Memorize the different types of ensembles		
1.3	Define the Boltsmann distribution and the role of the partition function.		
1.4	Clarify how the Fermi-Dirac and Bose-Einstein distributions differ.		
2.0	**Cognitive Skills**		
2.1	Discuss of essential facts, concepts, principles and theories relating to statistical	• Web-based study.	• Measuring the

	thermodynamics	• Lectures. • Scientific discussion • Library visits.	response to the assignments. • Periodic tests and assignments.
2.2	Apply the Fermi-Dirac and Bose-Einstein statistics to calculate thermal properties.		
2.3	Evaluate and interpret of chemical information and data		
2.4	Analyze problems and design plan strategies for their solution		
2.5	Use computational methodology and models skills based on practical applications of theories		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Manage resources, time and collaborate with members of the group	• Teamwork groups for cooperative work making. • Solving problems in groups during lecture. • Open discussion about recent topic of the course	• Oral presentations • Group discussion • Reports
3.2	Use university library and web search engines for collecting information and search about different topics		
4.0	**Communication, Information Technology, Numerical**		
4.1	Work effectively both in a team, and independently on solving chemistry problems.	• Use digital libraries for literature survey • Use E-Learning Systems for the communication with lecturer through the course work	• Web-based student performance systems. • Individual and group presentations. • Evaluating the activities of the students through the semester .
4.2	Communicate effectively with his lecturer and colleagues		
4.3	Use information and communication technologies		
5.0	**Psychomotor(if any)**		
5.1	Not applicable		

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

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)

- Availability of Staff members to provide counselling and advice.
- Office hours: During the working hoursweekly.
- Academic advisingforstudents.

E Learning Resources

1. List Required Textbooks

- P. W. Atkins & J. de Paula. Physical Chemistry (8thedn.), OUP, 2006.
- D. A. McQuarrie. Statistical Mechanics, Viva Books Pvt. Ltd., New Delhi, 2003
- John W. Daily. Statistical Thermodynamics, Cambridge University Press, 2018.

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

- Lecture hand outs available on the coordinator website.

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

- http//:en.wikipedia.org/wiki/
- http//:www.chemweb.com/
- Websites on the internet relevant to the topics of the course

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

* Non

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.)

- Appropriate teaching class including white board and data show with at least 25 seats.

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

- Computer halls access for the students will be helpful in doing their tasks during the course.

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

- Noother requirements.

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching

- Student discussion with the instructor allow for continuous feedback through the course progress.
- Student Evaluation Questionnaires.

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

- Discussions within the group of faculty teaching the course.
- Peer consultation on teaching strategies and its effectiveness.

3. Procedures for Teaching Development

• Workshops given by experts on new teaching and learning methodologies will be attended. • Improving of the teaching strategies by monitoring the evaluation of the students progress through the semester
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)** • Peer reviewing of random samples including periodic and final exams of the students will be done.
5. **Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.** • The course will be evaluated periodically after each semester based on the results of the students and the report presented by the teaching stuff that will be discussed with the course coordinator to improve the course.

Name of Course Instructor: **Dr. Ahmad Fawzy**

Signature: _____ Date Completed: 22 – 10 - 2018

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ Date Received: 23/10/2018

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: Advanced Organometallic Chemistry

Course Code: 402813-3

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 Organometallic Chemistry / 402813-3**
2. Credit hours: **3 (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. Hoda Abou El-Fetouh El-Ghamry**
5. Level/year at which this course is offered: **1st / 1st**
6. Pre-requisites for this course (if any): **None**
7. Co-requisites for this course (if any): **None**
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		percentage?	
b. Blended (traditional and online)	■	percentage?	80%
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	20%

Comments:

B Objectives

1. The main objective of this course

a- This course intends to introduce the students to understand some advanced aspects related to organometallic compounds.
b- Special emphasis will be on the catalytic applications of organometallic compounds in different organic reactions.

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)

- Variation of learning sources for the course, so that students benefit from more than one reference.
- Encourage students to prepare reports include the preparation and chemical properties of coordination and organometallic compounds.
- Link the theoretical and practical sides of the course to give the students to understand and interpret the properties of the complexes.
- The use of teaching intelligent classes 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
• Coordination chemistry of organometallic compounds.	**1**	**3**
• Organometallic compounds as a source of carbanions.	**2**	**6**
• Reactions of organic groups bonded to metals in which the metal-carbon bond is retained.	**1**	**3**
• Carbene chemistry and organometallic compounds.	**2**	**6**
• Stoichiometric applications of organometallic compounds to organic chemistry (main group elements compounds and transition metal compounds.	**3**	**9**
• Homogeneous catalysis and catalytic applications of organometallic compounds.	**2**	**6**
• Spectral properties of organometallic compounds.	**2**	**6**

• Magnetic properties of organometallic compounds.	1	3

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	42	---	---	---	---	42
	Actual	42	---	---	---	---	42
Credit	Planned	3	---	---	---	---	3
	Actual	3	---	---	---	---	3

3. Individualstudy/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	**Knowledge**		
1.1	Explain the relation between coordination chemistry and organometallic compounds.	• Lectures • Scientific discussion • Library visits • Web-based study	• Written mid-term and final exams. • Long and short essays. • web-based student performance systems
1.2	Identify the organometallic compounds as a source of carbanions.		
1.3	Memorize the stoichiometric applications of organometallic compounds to organic chemistry (main group elements compounds and transition metal compounds.		
1.4	Explain the spectral and magnetic properties of organometallic compounds		
2.0	**Cognitive Skills**		
2.1	Report the reactions of organic groups bonded	• Lectures	• Final and mid-term

	to metals in which the metal-carbon bond is retained	• Scientific discussion • Library visits • Web-based study	exams. • Measuring the response to the assignments.
2.2	Interpret examples of homogeneous catalysis and catalytic applications of organometallic compounds		
2.3	Discover the Spectral and magnetic properties of organometallic compounds		
2.4	Estimate the role of organometallic compounds as a source of carbanions		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Take the personality and responsibility for their own learning.	• Encourage the solving problems in groups during lecture. • Making open discussion about certain recent topic of the.	• Homeworks • Group reports.
3.2	Working effectively in groups and exercise leadership when appropriate		
3.3	Act ethically and consistently with high molar standards in personal and public fourms		
3.4	Community linked thinking		
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicate effectively in oral and written forms	• The use of computers in the training room of the department. • Organizing group visits to the Central Library. • The use of the international information network (internet).	• Ask questions that test the student's ability to interpret simple statistical information. • Assess the duties associated with the proper use of communication skills and numerical process
4.2	Use information and communication technologies		
4.3	Applythe basic mathematical and statistical techniques.		
5.0	**Psychomotor(if any)**		
5.1	Not applicable.		
5.2			

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	**Assignments and activities.**	**--**	**10 %**

2	**Midterm Exam.**	**8**	**30 %**
3	**Final Exam.**	**15-16**	**60 %**
4	**Total**	**100 %**	

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 hoursweekly.
- Academic advisingforstudents.
- Availability of Staff members to provide counselling and advice.

E Learning Resources

1. List Required Textbooks

- R.H. Crabtree, "The Organometallic Chemistry of the Transition Metals", 6th ed. Wiley publisher, 2014.
- P. Pérez "Advances in Organometallic Chemistry", 1st ed., Elsevier, 2018.

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

- Journal of organometallic chemistry.
- Journal of applied organometallic chemistry.

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

- http://link.springer.com/book/10.1007%2F978-1-349-18198-8
- http://eu.wiley.com/WileyCDA/WileyTitle/productCd-1118138074.html

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

- None.

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.)

- Equipped lecture hallspecializing in inorganic chemistry.

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

- Roomequippedwithcomputers, data show andTV.

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

- Structured group discussions and/or focus groups.
- Questionnaires can be used to collect student feedback.
- Student representation on staff-student committees and institutional bodies.

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

- 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.
- 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.
- Visits by other faculty can provide information about the process of teaching.
- Colleagues have the expertise to evaluate the quality of a course as evidenced by its content and format (peer reviewers)..

3. Procedures for Teaching Development

- Providing new tools for learning.
- The application of e-learning.
- Exchange of experiences internal and external.
- Training programsand workshops for Staff member.
- Review of strategies proposed.

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 by an independent member teaching staff of a sample of student work.
- Periodic exchange and remarking of tests or a sample of assignments with staff at another institution.

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

- Workshops for teachers of the course.
- Periodic review of the contents of the syllabus and modify the negatives.
- Consult other staff of the course.
- Hosting a visiting staff to evaluate of the course.

Name of Course Instructor: Dr. Hoda Abou El-Fetouh El-Ghamry

Signature: - **Date Completed: 21/10/2018**

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ Date Received: 22/10/2018

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Statistical Analytical Chemistry**

Course Code: **402814-3**

Date: 24-10-2018	**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: **Statistical Analytical Chemistry / 402814-3**
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: **Prof. Amr Lotfy Saber**
5. Level/year at which this course is offered: **1st / 1st**
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		percentage?	
b. Blended (traditional and online)	■	percentage?	100%
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

By completing this course, the students will be familiar with:

- The statistical treatment and analysis of data.
- The uncertainties; calibrations; detection limits; interferences; quality control and assurance and validation of analytical methods
- How to classify sampling and physical state, sampling of liquids, gas and solids.
- Using probability distributions and confidence intervals for populations, probability distributions and confidence intervals for samples,
- Comparing between accuracy and precision: determinate errors, indeterminate errors, significant figures, standard deviation, propagation of errors, the confidence limit, tests of significance, rejection of a result, linear least squares, correlation coefficient and coefficient of determination, detection limits.

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)

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

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
The language of analytical chemistry: analysis, determination, and measurement, techniques, methods, procedures, and protocols, classifying analytical techniques, selecting an analytical method.	2	6
Statistical treatment and analysis of data: accuracy, precision, sensitivity, detection limit, limit of quantization, linearity, range, selectivity, selectivity coefficient, robustness and ruggedness.	2	6

Developing the procedure: calibration and standardization, populations and samples (probability distributions for populations, confidence intervals for populations, probability distributions for samples.	1	3
Confidence intervals for samples, sampling procedure, sampling and physical state, sampling of liquids, gas and solids, preparation of laboratory sample, moisture in samples and validation of analytical methods.	2	6
Significance testing, significant figures, errors in significance testing, propagation of uncertainty and characterizing experimental errors	1	3
Errors in chemical analysis, mean, median, classification of errors, determinate errors, indeterminate errors, absolute error, relative error, gross errors and Bias	1	3
Types of systematic errors (instrumental errors, chemical or method errors and personal errors).Difference between constant error and proportional error	1	3
The standard deviation, average deviation, propagation of errors, relative average deviation, rejection of a result, linear least squares, correlation coefficient and coefficient of determination.	1	3
The principal components of aquality assurance program: quality control and quality assessment.	1	3
Revision	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						
Credit	Planned	3	--	--	--	--	3
	Actual						

3. Individual study/learning hours expected for students per week.	3 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	Recognize statistical treatment and analysis of data.	• Lectures • Scientific discussion • Library visits • Web-based study • Using open discussion to link the previous knowledge to the current and future topics • The students use the internet to prepare an essay about a recent advances related to the course	• Exams • web-based student performance systems • portfolios • long and short essays
1.2	Identify parameters such as analysis, determination, measurement, techniques, methods, procedures, and protocols.		
1.3	Define the classification of analytical techniques and selecting an analytical method		
1.4	Familiar with uncertainties; calibrations; detection limits; interferences; quality control and assurance and validation of analytical methods		
1.5	Know the classification of sampling and physical state, sampling of liquids, gas and solids		
1.6	Recognize the deference between accuracy and precision: determinate errors, indeterminate errors, significant figures, standard deviation		
1.7	Outline the propagation of errors, the confidence limit, tests of significance, rejection of a result, linear least squares, correlation coefficient and coefficient of determination, detection limits and quality control		
2.0	**Cognitive Skills**		

2.1	Design the schematic diagram of the analytical approach to problem solving, showing the role of the quality assurance program	• Lectures • Scientific discussion • Library visits • Web-based study • Using brain storming at the beginning of each lecture in order to stimulate the students towards the new topic of the course. • Enhancing open discussion during the lecture.	• Exams • web-based student performance systems • portfolios • long and short essays • Through assignments and homework.
2.2	Apply the suitable methods to analysis the data		
2.3	Formulate the different types of errors		
2.4	Confirm the accuracy and precision: determinate errors, indeterminate errors, significant figures, standard deviation		
2.5	Apply the quality control and quality assurance		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Take the personality and responsibility for their own learning.	• Encourage the solving problems in groups during lecture. • Making open discussion about certain recent topic of the course.	Homework and group reports
3.2	Work effectively in groups and exercise leadership when appropriate.		
3.3	Act ethically and consistently with high molar standards in personal and public forums.		
3.4	Community linked thinking		
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicate effectively in oral and written forms.	• Lectures • Scientific discussion • Library visits • Web-based study	• Exams • web-based student performance systems • portfolios • long and short essays
4.2	Use information and communication technologies		
4.3	Use basic mathematical and statistical techniques.		

5.0	**Psychomotor(if any)**		
5.1	Not Applicable		
5.2			

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

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 counselling and advice.
- Office hours: During the working hours weekly.
- Academic Advising for students.

E Learning Resources

1. List Required Textbooks
   - R. Gopalan "*Analytical Methods: Interpretation, Identification, Quantification*", 1st ed., Orient BlackSwan, 2018.
2. List Essential References Materials (Journals, Reports, etc.)
   - Lecture Handouts available on the coordinator website.
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.

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.)
   - Equipped classrooms.
   - Providing hall of teaching aids including computers and projector.
2. Technology resources (AV, data show, Smart Board, software, etc.)
   - Room equipped with computer and 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
   - Complete the questionnaire evaluation of the course in particular

2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
   - Observations and the assistance of colleagues.
   - 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.
   - Continuous training of member staff.
   - Review of strategies proposed.
   - 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.
   - Periodic Review of the contents of the syllabus and modify the negatives.
   - 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: ____Prof. Amr Lotfy Saber_____

Signature: _____ Date Completed: ___24/10/2018_____

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ Date Received: 25/10/2018

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title:

Modern Techniques in Organic Spectroscopy

Course Code: **402821-3**

Date: 27-10-2018	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: **Modern Techniques in Organic Spectroscopy / 402821-3**
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: **Prof. Dr. Mohamed Rabie**
5. Level/year at which this course is offered:**2nd / 1st**
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		percentage?	
b. Blended (traditional and online)		percentage?	100%
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

By the end of this course student will be familiar with compounds analysis by modern techniques in structure elucidation of organic molecules (such as; UV-spectroscopy, infra-red spectroscopy, NMR-Spectroscopy, mass spectrometry).

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)

- The students will be training to use highly advanced data base services, and/or websites to improving interpretation of compounds with advances spectroscopy

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
Review of principals of spectroscopy and index of hydrogen deficiency.	1	3
Proton NMR spectra. Chemical shifts- Spin-spin coupling- Chemical and magnetic equivalence in ^{1}H NMR.	1	3
First order spectra. Non-First order spectra. Simplification of complex spectra.	1	3
^{13}C-NMR spectra. NMR spectra of other nuclei.	1	3
Two-dimensional NMR. H-H-COSY. H-C-COSY.	2	6
Inversed H-C-COSY (HMQC). Long range H-C-COSY (HMBC).	2	6
Factors affecting coupling constant. Chemical shifts in ^{13}CNMR.	1	3
IR in elucidation of organic compounds structures.	1	3

Advanced mass spectrometry and fragmentation patterns.	2	6
UV in accounting the organic structural analysis.	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. Individualstudy/learning hours expected for students per week. 4

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	Remember the general principals of different types of spectroscopy.	• Lectures • Scientific discussion • Library visits	• Exams • web-based student performance systems • portfolios
1.2	Know factors affecting chemical shift and spin-spin coupling in ^{1}HNMR. Factors affecting coupling constant.		

1.3	Describe chemical shifts in ^{13}CNMR. Broadband proton decoupling in ^{13}C-NMR; Off-resonance proton decoupling.	• Web-based study	• long and short essays • posters • lab manuals
1.4	Familiar with distortionless enhancement by polarization transfer (DEPT)		
1.5	Identify nuclear overhauser and exchange spectroscopy (NOESY).		
1.6	Familiar with Heteronuclear correlation spectroscopy. Inversed H-C-COSY (HMQC).Long range H-C-COSY (HMBC).		
2.0	**Cognitive Skills**		
2.1	Apply dstortionless enhancement by polarization transfer (DEPT)	• Scientific discussion • Library visits • Web-based study	• Exams • web-based student performance systems • portfolios • posters • individual and group presentations • video analysis • lap manuals
2.2	Predict nuclear overhauser enhancement (NOE) in ^{1}H- and ^{13}C-NMR; Pulse fourer transform NMR		
2.3	Compare between COSY, NOESY, Inversed H-C-COSY (HMQC), and Long range H-C-COSY HMBC.		
2.4	Summarize the spectroscopy of organic compounds		
2.5	development reverse thinking skill (back thinking)		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Use the advanced spectroscopy to elucidate the structure of compounds.	• Library visits • Scientific discussion • Web-based study	• web-based student performance systems • individual and group presentations
3.2	justify the structure of compound according to spectroscopy		
3.3	Ability to communicate results of work to classmates.		
3.4	Ability to work in a team to perform a specific task.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Demonstrate structure for organic compounds	• Scientific	• web-based student

	with Advanced spectroscopy.	discussion • Library visits • Web-based study	performance systems • individual and group presentations
4.2	Use information and communication technology.		
4.3	The ability to use e-mail to communicate with the instructor and other students.		
4.4	Scientific writing.		
4.5	Use his/her observations to solve problems.		
5.0	**Psychomotor(if any)**		
5.1	Not applicable		
5.2			

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
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 havefaculty membersto providecounselling andadvice.
- Office hours: During the working hoursweekly.
- Academic advisingforstudents.

E Learning Resources

1. List Required Textbooks

- T. D. W. Claridge, High-Resolution NMR Techniques in Organic Chemistry, 3rd ed., UK, Elsevier Ltd. (2016).
- D. H. Williams and I. Fleming, Spectroscopic Methods in Organic Chemistry, 6th ed., McGraw-Hill Education, (2007).

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

1. Journal of Organic Chemistry. 2. Russian Journal of Organic Chemistry. 3. Optics and Spectroscopy. 4. Any other journals in the field of the course will be considered.
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. • http://www.chemweb.com • http://www.sciencedirect.com • http://www.rsc.org • http://stream.hebust.edu.
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 • Complete the questionnaire evaluation of the course in particular.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department

- Observationsandthe assistance ofcolleagues.
- Independent evaluation forextent toachieve students the standards.
- Independent adviceofthe dutiesandtasks.

3. Procedures for Teaching Development

- Workshopsforteaching methods.
- Continuous trainingofmember staff.
- Providing new tools for learning.
- The application ofe-learning.
- Exchangeof experiencesinternal andexternal.

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 markingof a sampleofexam papers, orstudent 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.

- Periodic reviewofthecontents ofthe syllabusandmodify thenegatives.
- Consultotherstaff ofthe course.
- Hostinga visiting staffto evaluate of thecourse.
- Workshopsfor teachers ofthe course.

Name of Course Instructor: **Prof. Dr. Mohamed Rabie**

Signature: **Date Completed: 27- 10 - 2018**

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ **Date Received: 28/10/2018**

4/1/4. Course Specification:

COURSE SPECIFICATIONS
Form

Course Title: **Quantum Chemistry**

Course Code: **402822-3**

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: **Quantum Chemistry / 402822-3**
2. Credit hours: **3 (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. Jaber El Fahemi**
5. Level/year at which this course is offered: **2nd / 1st**
6. Pre-requisites for this course (if any): --
7. Co-requisites for this course (if any): --
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		percentage?	
b. Blended (traditional and online)	■	percentage?	90
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	10

Comments:

B Objectives

1. The main objective of this course

The goal of course is to provide those post graduate students in chemistry with basic knowledge of quantum chemistry and interest in working in the fields of computational and theoretical chemistry with wave function based methods and their origin in fundamental quantum mechanics.

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)

- Updating the course content with the techniques that will be recently introduced in the field.
- The use of smart teaching halls for lectures.
- Increased use of IT or web based reference material.
- Encourage students to carry out research reports in the subjects using the library, data base services, and/or websites.

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
Many-electron quantum mechanics	2	6
Exact and approximate wave functions	2	6
Solution of the Hartree–Fock equations	2	6
Configuration interaction	2	6
Coupled-cluster theory	1	3
Basis sets and molecular integrals	2	6
Numerical benchmarking of electronic-structure models	2	6

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.

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	Recognize the central aspects of the quantum-chemical methods for molecules	• Use of the internet to carry out some reports on course subjects. • Lectures • Discussion groups • Seminar • In class problems	• Written assignments • Presentations • Formal mid-term and final exams.
1.2	Account for the basic principles behind some methods that combine quantum mechanics and classical force fields.		
1.3	Differentiate between the advantages and disadvantages of the various methods discussed in the course.		
1.4	Describe some of the important and timely current problems within the area of quantum chemistry methods and calculations internationally.		
2.0	**Cognitive Skills**		
2.1	Use some of these models and methods in practical quantum-chemical calculations.	• Web-based study. • Lectures. • Scientific discussion • Library visits.	• Measuring the response to the assignments. • Periodic tests and assignments.
2.2	Predict the different electronic wave functions.		
2.3	Explain the contents of Density Functional Theory and correlated methods like Configuration Interaction, Møller Plesset Perturbation Theory and Coupled Cluster.		
2.4	Apply perturbation theory in the calculation of different properties of atoms and molecules.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Manage resources, time and collaborate with members of the group	• Teamwork groups for cooperative work making. • Solving problems in groups during lecture.	• Oral presentations • Group discussion • Reports
3.2	Use university library and web search engines for		

	collecting information and search about different topics	• Open discussion about recent topic of the course	
4.0	**Communication, Information Technology, Numerical**		
4.1	Work effectively both in a team, and independently on solving chemistry problems.	• Use digital libraries for literature survey • Use E-Learning Systems for the communication with lecturer through the course work	• Web-based student performance systems. • Individual and group presentations. • Evaluating the activities of the students through the semester .
4.2	Communicate effectively with his lecturer and colleagues		
4.3	Use information and communication technologies		
5.0	**Psychomotor(if any)**		
5.1	Not applicable		

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Assignments and activities.	--	10 %
2	Midterm Exam.	8	30 %
3	Final Exam.	15-16	60 %
4	Total		100%

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)
   - Availability of Staff members to provide counselling and advice.
   - Office hours: During the working hours weekly.
   - Academic advising for students.

E Learning Resources

1. List Required Textbooks

- T. Helgaker, P. Jørgensen, and J. Olsen, (2013). Molecular Electronic Structure Theory, Wiley, 1 edition.
- Kong Wan, Quantum Mechanics: A Fundamental Approach, 1st ed., CRC press, 2019.

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

- Lecture hand outs available on the coordinator website.

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

- http//:en.wikipedia.org/wiki/
- http//:www.chemweb.com/
- Websites on the internet relevant to the topics of the course

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

- Computational chemistry software packages will be considered whenever appropriate.

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.)

   - Appropriate teaching class including white board and data show with at least 25 seats.

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

   - Computer halls access for the students will be helpful in doing their tasks during the course.

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

   - Computational software will be helpful such as hyperchem program package.

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching

- Student discussion with the instructor allow for continuous feedback through the course progress.
- Student Evaluation Questionnaires.

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

- Discussions within the group of faculty teaching the course.
- Peer consultation on teaching strategies and its effectiveness.

3. Procedures for Teaching Development

- Workshops given by experts on new teaching and learning methodologies will be attended.
- Improving of the teaching strategies by monitoring the evaluation of the students progress through the semester

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)

- Peer reviewing of random samples including periodic and final exams of the students will be done.

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

- The course will be evaluated periodically after each semester based on the results of the students and the report presented by the teaching stuff that will be discussed with the course coordinator to improve the course.

Name of Course Instructor: **Dr. Jaber El Fahemi**

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

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ **Date Received: 27/10/2018**

4/1/4. Course Specification:

COURSE SPECIFICATIONS
Form

Course Title: Solid State Chemistry

Course Code: 402823-3

Date: 22-10-2018	**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: **Solid State Chemistry / 402823-3**
2. Credit hours:**3 (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: **Prof. Nashwa Mahmoud El-Metwaly**
5. Level/year at which this course is offered:**2nd / 1st**
6. Pre-requisites for this course (if any):**None**
7. Co-requisites for this course (if any):**None**
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		percentage?	
b. Blended (traditional and online)		percentage?	70%
c. E-learning		percentage?	30%
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

This course aims to knowing the following: fundamentals regarding the solid state, including selected structural examples. Theoretical and practical crystallography. Unary and binary phase diagrams. X-ray diffraction, thermal analysis and introduction to other characterization techniques.

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)

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

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
• The principles concerning solid state structures.	2	6
• Describing specific crystal structures by applying basic crystallographic concepts.	2	6
• The generation of X-ray radiation and its effects on matter.	2	6
• The experimental use of the diffraction phenomenon.	2	6
• Using powder diffraction data for characterizing cubic substances.	1	3
• Relating diffraction intensities mathematically to structural parameters and derive extinction conditions.	2	6
• Using crystallographic data for a validated phase analysis.	1	3
• Analyzing thermograms and phase diagrams in known systems.	1	3

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

	Lecture	Tutorial	Laboratory/	Practical	Other	Total

				Studio			
Contact Hours	Planned	39	**3**	---	---	---	42
	Actual	39	**3**	---	---	---	42
Credit	Planned	3	---	---	---	---	3
	Actual	3	---	---	---	---	3

3. Individualstudy/learning hours expected for students per week. **3**

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	Describe the principles of solid state structures	• Using open discussion to link the previous knowledge to the current and future topics. • The students use the internet to prepare an essay about recent advances related to the course.	• Written tests. • Evaluate effective participation of students during lecture presentation. • Home work duties assigned in e-learning site.
1.2	Identify crystal structures by applying basic crystallographic concepts		
1.3	Know the process for generation of X-ray radiation and its effects on matter		
1.4	Recognize the experimental use of the diffraction phenomenon		
1.5	Explain how to use powder diffraction data for characterizing cubic substances		
1.6	Understand diffraction intensities mathematically to structural parameters and derive extinction conditions		
1.7	Memorize the use of crystallographic data for a validated phase analysis		

1.8	Know how to analyze thermo-grams and phase diagrams in known systems		
2.0	**Cognitive Skills**		
2.1	Compare between different crystals.	• Using brain storming at the beginning of each lecture in order to stimulate the students towards the new topic of the course. • Enhancing open discussion during the lecture.	• Discussion and interactive note realize the extent of the student scientific material that displays • Written tests
2.2	Discover experimental use of the diffraction phenomenon		
2.3	Apply how to use powder diffraction data for characterizing cubic substances		
2.4	Interpret crystallographic data for a validated phase analysis		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Encourage students towards responsibility for themselves and toward others.	• Duties for individual students on e-learning site where each student depends on himself • Encourage the solving problems in groups during lecture. • Making open discussion about certain recent topic of the course.	• Assessment of assignments includes portion of grade for effectiveness of investigation processes. • Personal performance in classroom.
3.2	Encourage the work in group to make the students aware with responsibility		
3.3	Install self-learning character in the student		
3.4	Guide student about ethics of dealing with his colleagues and with the instructors and supervisor		
4.0	**Communication, Information Technology, Numerical**		
4.1	Able to communicate with his colleagues across all available tools	• Applying the smart teaching • Assignments by using the e-learning tools. • Given 5 min at the end of each lecture to selected one of students to re-mentioned again the main topics introduced in lecture.	• Final and midterms exams include different problems need numerical and technical skills.
4.2	Enrich the knowledge in information technology that will enable them to gather, interpret, and communicate information and ideas		
4.3	Must have sufficient information about how to thinking to solve problems that will enable them to apply in interpreting and proposing solutions		
4.4	Communicate via the available electronic tools		
4.5	Use of search engines across the Web		
5.0	**Psychomotor(if any)**		

5.1 5.2	Not applicable.

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

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: 3 hours
- Total 3 hrs. of office hours for individual student consultations and academic advice per week in e-learning as mentioned before.

E Learning Resources

1. List Required Textbooks

- Anthony R. West, Solid State Chemistry and its Applications, 2nd ed., Wiley, 2014.
- Amnon Aharony and Ora Entin-Wohlman "Introduction to Solid State Physics", World Scientific Publishing, 2018.

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

- Journal of Solid State Chemistry.
- Solid State Science

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

- http://www.mx.iucr.org/iucr-top/comm/cteach/pamphlets/13/node5.html
- http://img.chem.ucl.ac.uk/sgp/mainmenu.htm
- http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro3.htm
- www.shef.ac.uk/.../solid-state-chemistry-applications-msc
- www.simplybooks.in/solid-state-chemistry-its-anthony-r-book..
- www.infibeam.com/.../solid-state-chemistry-its-applications/9...

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

- Isisdraw and Chemdraw and Chemoffice Software
- http://scholle.oc.uni-kiel.de/herges/modeling/gliederung.html
- http://chem-faculty.ucsd.edu/trogler/GroupTheory224/Grouptheory.html
- http://phycomp.technion.ac.il/~ira/types.html

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.) • Smart classes are needed equipped with Internet access (scheduled for 3 hours once a week).
2. Technology resources (AV, data show, Smart Board, software, etc.) • Common computer lab containing at least 25 computer sets. • High speed internet access.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) • Required programs specific for chemistry students.

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching. • Confidential completion of standard course evaluation questionnaire. • Focused group discussion with small groups of students. • Review with the department chairman.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • Observations and assistance from colleagues. • Independent assessment of standards achieved by students. • Independent advice on assignment tasks.
3. Procedures for Teaching Development • Workshops on teaching methods. • Review of recommended teaching strategies.
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 by an independent member teaching staff of a sample of student work. • Periodic exchange and remarking of tests or a sample of assignments with staff at another institution.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. • Periodic revision of the course from concerned parties in the department and college, and improving it according to what is known in distinguished universities worldwide.

Name of Course Instructor: Prof. Nashwa Mahmoud El-Metwaly

Signature:  **-** **Date Completed: 22/10/2018**

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ **Date Received: 23/10/2018**

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Separation and Method Validation**

Course Code: **402824-3**

Date: 26-10-2018	**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: **Separation and Method Validation / 402824-3**
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: **2nd / 1st**
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	☐	percentage?	☐
b. Blended (traditional and online)	■	percentage?	80%
c. E-learning	■	percentage?	20%
d. Correspondence	☐	percentage?	☐
f. Other	☐	percentage?	☐

Comments:

B Objectives

1. The main objective of this course

By the end of this course, the students will be familiar with:

- The physical and chemical principles of separations
- The new tools in separation as isoelectric focusing; 2D gel electrophoresis and electro-chromatography.
- The regulations, standards, and guidelines, risk-based validation and qualification, validation of analytical methods, data review and validation and evaluation of uncertainty.

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.
- The use of smart teaching halls for lectures.
- 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.

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
a- Physical and chemical principles of separations	1	3
b- Column technology for gas, liquid, and supercritical fluid chromatography: Theory, principles, and instrumentation;	2	6
c- Estimation of the quality of a separation system and Van Deemter equation.	1	3
d- Applications of ion chromatography, gel permeation, packing material, elution gradients, retention index, gas chromatography (gas-solid, gas-liquid, capillary gas).	2	6
e- Electrophoresis; Capillary electrophoresis (CE); Zone electrophoresis.	1	3

f- Isoelectric focusing; 2D gel electrophoresis; Electrochromatography; Sodium dodecyl sulphate polyacrylamide gel electrophoresis (SDS-PAGE).	1	3
g- Supercritical fluid chromatography (SCFC); Physical processes, modern instrumentation, and response characteristics of detectors relevant to these methods.	2	6
h- Regulations, standards, and guidelines, risk-based validation and qualification.	2	6
i- Validation of analytical methods, data review and validation and evaluation of uncertainty.	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 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	• Understand the physical and chemical principles of separations.	• Lectures • Scientific discussion	• Written mid-term and final

1.2	• Describe the column technology for gas, liquid, and supercritical fluid chromatography.	• Use the library to work duties and a small research on separation and method validation. • Use of the internet to carry out some reports on course subjects.	exams. • Long and short essays
1.3	• Identify the quality of a separation system and Van Deemter equation.		
1.4	• Recording the applications of ion chromatography, gel permeation, packing material and elution gradients.		
1.5	• Explain the electrophoresis; Capillary electrophoresis (CE) as well as Zone electrophoresis.		
1.6	• Compare between isoelectric focusing and 2D gel electrophoresis.		
1.7	• Outline the regulations, standards, and guidelines in addition to risk-based validation and qualification.		
1.8	• Write about data review and validation and evaluation of uncertainty.		
2.0	Cognitive Skills		
2.1	• Modify the quality of a separation system.	• Lectures • Scientific discussion • Library visits • Web-based study • Using brain storming at the beginning of each lecture in order to stimulate the students towards the new topic of the course. • Enhancing open discussion during the lecture.	• Mid-term and final exams. • Measuring the response to the assignments. • Through assignments and homework
2.2	• Explain the application of sodium dodecyl sulphate in polyacrylamide gel electrophoresis (SDS-PAGE).		
2.3	• Construct the supercritical fluid chromatography (SCFC).		
2.4	• Report the characteristics of detectors relevant to Supercritical fluid chromatography (SCFC).		
2.5	• Interpret the validation of analytical methods.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	• Operate in team work and accept his college's opinions.	• Dividing students into groups to carry	• Evaluate the results of

3.2	• Choose the suitable method to solve problems.	out collective scientific reports. • Periodic individual duties to develop the skill of taking responsibility and self-reliance.	collective works and duties as well as knowing the contribution of each individual through dialogue and discussion. • Assessment of individual tasks and duties to determine the student's ability to self-reliance.
3.3	• Develop the student's ability in self-reliance and responsibility.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Use computers and the international information network (the Internet) to perform calculations and to identify recent research relevant to decision sources.	• Visiting research centers. • The use of computers in the training room of the department. • Using the internet for collecting data.	• Evaluation of the duties associated with the proper use of numerical and communication skills. • Web-based student performance systems. • Individual and group presentations.
4.2	Communicate effectively in oral and written forms.		
4.3	Use basic mathematical and statistical techniques to perform data analysis.		
5.0	**Psychomotor(if any)**		
5.1	Not applicable.		

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Activities and Assignments.	--	10 %
2	Midterm Exam.	8	30 %
3	Final Exam.	15-16	60 %

4	**Total**	100 %

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

1- *Validation and Qualification in Analytical Laboratories*, Ludwig Huber, 2ed edition, New York, NY 10017, 2007 by Informa Healthcare USA, Inc.

2- *Bioanalysis of Pharmaceuticals, Sample Preparation, Separation Techniques, and Mass Spectrometry*, STEEN HONORÉ HANSEN, 2015 John Wiley & Sons, Ltd.

3- *Green ChromatographicTechniques Separation and Purification of Organic and Inorganic Analytes*, Inamuddin, Ali Mohammad, 2014, Springer Dordrecht Heidelberg London New York

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

1- Faure K, Bouju E, Suchet P, Berthod A (2013) Use of limonene in CCC: a green alkane substitute. Anal Chem 85:4644-4650. doi:10.1021/ac4002854

2- Lee J, Gupta S, Huang J, Jayathilaka LP, Lee B (2013) HPLC-MTT assay: anti-cancer activity of aqueous garlic extract is from allicin. Anal Biochem 436:187–189

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

1- *Analytical Method Validation and Instrument Performance Verification*, Chung Chow Chan, 2004, John Wiley & Sons, Inc., Hoboken, New Jersey.

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.)

- Equipped lecture hall specializing in separation and method validation.

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

- Room equipped with computers, data show 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. • Structured group discussions and/or focus groups. • Questionnaires can be used to collect student feedback.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • Colleagues have the expertise to evaluate the quality of a course as evidenced by its content and format (peer reviewers). • 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. • 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. • Visits by other faculty can provide information about the process of teaching.
3. Procedures for Teaching Development • Exchange of experiences internal and external. • Training programs and workshops for Staff member. • The application of e-learning.
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) • Periodic exchange and remarking of tests or a sample of assignments with staff at another institution. • Check marking by an independent member teaching staff of a sample of student work.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. • Hosting a visiting staff to evaluate of the course. • Periodic review of the contents of the syllabus and modify the negatives. • Consult other staff of the course.

Name of Course Instructor: Dr. Mohammed Ahmed Kassem

Signature: _____ Date Completed: 26 – 10 - 2018

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ Date Received: 27/10/2018

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Research Methods and Seminar**.

Course Code: **402831-3**

Date: 24-10-2018	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: Research Methods and Seminar /402831-3
2. Credit hours: 3
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. Ahmed Fawzy**
5. Level/year at which this course is offered: **3rd / 2nd**
6. Pre-requisites for this course (if any): --
7. Co-requisites for this course (if any): --
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	■	percentage?	50
b. Blended (traditional and online)	■	percentage?	10
c. E-learning	■	percentage?	20
d. Correspondence		percentage?	
f. Other	■	percentage?	20

Comments:

B Objectives

1. The main objective of this course

By the end of this course the students will be able to:

- Carry out a theoretical or experimental search in one of the chemistry branches (inorganic, physical, organic or analytical) under supervision of one of the department staff members.
- Present a full report about his seminar topic.
- Give a seminar with discussion about his obtained results.

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 modern topics in chemistry using the library, data base services, and/or websites.

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
Student will carry out a theoretical or experimental search in one of the chemistry branches (inorganic, physical, organic or analytical) under supervision of one of the department staff members. After finishing his search, he should present a full report and give a seminar with discussion about his obtained results.	**13**	**39**

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 hours

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	Describe the selected techniques applied in chemistry field.	• Use of the internet to carry out some reports. • Scientific discussion. • Use the library to work duties and a small search.	• Long and short essays. • Final presentation and exam.
1.2	Remember the role of modern applications of chemistry in our life.		
1.3	Write on some selected topics in different branches of chemistry.		
1.4	Determine the mechanism of some selected new chemical reactions.		
1.5	Clarify some selected subjects in chemistry.		
2.0	**Cognitive Skills**		
2.1	Report the properties and structure of some new chemical compounds.	• Web-based study. • Scientific discussion • Library visits.	• Measuring the response to the assignments. • Final presentation and exam.
2.2	Estimate the properties of newly prepared compounds.		
	Apply the modern analytical and spectral techniques in chemistry.		
	Predict the distinctive features of new investigated compounds.		
	Design new compounds for special applications.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Manage resources, time and collaborate with members of the group	• Teamwork groups for cooperative work making. • Solving problems in groups during lecture. • Open discussion	• Oral presentations • Group discussion • Reports
3.2	Use university library and web search engines for collecting information and search about different		

	topics	about recent topic of the course	
4.0	**Communication, Information Technology, Numerical**		
4.1	Work effectively both in a team, and independently on solving chemistry problems.	• Use digital libraries for literature survey • Use E-Learning Systems for the communication with lecturer through the course work	• Web-based student performance systems. • Individual and group presentations. • Evaluating the activities of the students through the semester .
4.2	Communicate effectively with his lecturer and colleagues		
4.3	Use information and communication technologies		
5.0	**Psychomotor(if any)**		
5.1	Not applicable		

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Assignments and activities.	weekly	40%
2	Final presentation and exam.	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)
   - Availability of Staff members to provide counselling and advice.
   - Office hours: During the working hours weekly.
   - Academic advising for students.

E Learning Resources

1. List Required Textbooks

- Chan K.Seng, Understanding Basic Chemistry Through Problem Solving: The Learner'S Approach, 1st ed., WS EDUCATION, 2018.
- Reza K. Haghi, Modern Physical Chemistry: Engineering Models, Materials, and Methods with Applications, 1st ed., Taylor and Francis, 2018.

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

- Journal of Physical Chemistry A.
- Journal of the American Chemical Society.
- Journal of Materials Chemistry.

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

- http//:en.wikipedia.org/wiki/
- http//:www.chemweb.com/
- Websites on the internet relevant to the topics of the course

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

- No others.

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.)

- Appropriate teaching class including white board and data show.

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

- Computer halls access for the students will be helpful in doing their tasks during the course.

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 discussion with the instructor allow for continuous feedback through the course progress.
- Evaluation of student questionnaires.

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

- Discussions within the group of faculty teaching the course.
- Peer consultation on teaching strategies and its effectiveness.

3. Procedures for Teaching Development

- Workshops given by experts on new teaching and learning methodologies will be attended.
- Improving of the teaching strategies by monitoring the evaluation of the students progress through the semester

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)

- Peer reviewing of random samples including periodic and final exams of the students will be done.

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

- The specification will be evaluated periodically after each semester based on the results of the students and the report presented by the teaching stuff that will be discussed with the course coordinator to improve the course.

Name of Course Instructor: Dr. Ahmed Fawzy
Signature: _____ **Date Completed:** 24 – 10 - 2018
Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ **Date Received:** 25/10/2018

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Advanced Organic Synthesis**

Course Code: **402832-3**

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: **Advanced Organic Synthesis / 402832-3**
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: **Prof. Dr. Saleh A. Ahmed**
5. Level/year at which this course is offered: **3rd / 2nd**
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		percentage?	
b. Blended (traditional and online)		percentage?	80%
c. E-learning		percentage?	20%
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

By the end of this course student will be familiar with different reactions to synthesis of different classes of organic compounds.

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)

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

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
Protecting and deprotecting groups	1	3
Click chemistry in heterocyclic synthesis.	1	3
1,3-Dipolar cycloadditions.	1	3
Pericyclic reactions.	2	6
Formation of C-C bond via coupling reactions.	1	3
Formation of C-C bond via Aldol-enolates.	2	6
Formation of C-C bond via radical processes.	1	3
Heterocyclic synthesis via ring elaboration.	1	3
Metal mediated cycloadditions and metathesis processes.	1	3
Retrosynthesis and disconnection approach.	2	6

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. Individualstudy/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	**Knowledge**		
1.1	Know the modern methods used in the preparation of various organic compounds	• Lectures • Scientific discussion • Web-based study • Library visits	• Exams • web-based student performance systems • portfolios • long and short essays • posters
1.2	Recognize the different methods used in the formation of various C-C bonds		
1.3	Identify the different protecting and deprotecting groups used in organic synthesis		
1.4	Write the products of chemical reaction correctly		
1.5	Recognize the modern methods used in the synthesis of heterocycles		
2.0	**Cognitive Skills**		

2.1	Compare between different types of reactions used in organic synthesis	• Lectures • Scientific discussion • Web-based study • Library visits	• Exams • web-based student performance systems • portfolios • long and short essays • posters • demonstrations
2.2	Design of different strategies for preparation of different classes of organic compounds		
2.3	Predict the products of different organic reactions		
2.4	Summarize the different methods of organic synthesis		
2.5	Discoverthe importance of different methods used inorganic reactions		
2.6	Formulate the outputs of different reactions used in organic synthesis		
2.7	Design the synthetic pathway of different organic compounds using retrosynthetic approach		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Use the basic knowledge of organic chemistry to synthesis organic reaction mechanism	• Lectures • Scientific discussion • Web-based study	• Exams • web-based student performance systems
3.2	Determine the different methods to synthesis of different classes of organic compounds		
3.3	Use the retrosynthetic approach to synthesis of different organic molecules		
4.0	**Communication, Information Technology, Numerical**		
4.1	Evaluate the importance of different organic reactions	• Lectures • Scientific discussion • Library visits	• Web-based student performance systems • Individual and group
4.2	Demonstrate a synthetic pathways for synthesis of different classes of organic compounds		

4.3	Demonstrate the mechanism of different organic reactions	• Web-based study	presentations
4.4	Evaluate the different methods to synthesis of various organic compounds		
4.5	Evaluate the importance of different organic reactions		
5.0	**Psychomotor(if any)**		
5.1	Not applicable		
5.2			

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
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

- Dmitry V. Liskin, Penny Chaloner “Advanced Organic Synthesis”, 2015.
- Michael Smith, Organic Synthesis, 4th, Elsevier, 2016.

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

- Lecture handouts available on the coordinator website.
- John McMurry's "Organic Chemistry, 8th edition, International Edition" 2011, Brooks/Cole.

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

- http://www.organic-chemistry.org/reactions.htm
- http://www.chemweb.com
- http://www.sciencedirect.com
- http://www.rsc.org
- http://www.orgsyn.org

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

- Chem Draw 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

- Questionnaires can be used to collect student feedback.
- Student representation on staff-student committees and institutional bodies.
- Structured group discussions and/or focus groups.

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

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

4. Procedures for Teaching Development

- Workshops for teaching methods.
- Continuous training of member staff.
- Review of strategies proposed.
- 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. • Periodic review of the contents of the syllabus and modify the negatives. • 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: **Prof. Dr. Saleh A. Ahmed**

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

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

Signature: _____ **Date Received:** **25/10/2018**

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Advanced Heterocyclic Chemistry**

Course Code: **402833-3**

Date: 30–10–2018	**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 Heterocyclic Chemistry / 402833-3**
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:**Prof. Dr. Thoraya A. Farghaly**
5. Level/year at which this course is offered:**3rd/ 2nd**
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 ☐ percentage? ☐ b. Blended (traditional and online) ☐ percentage? 100% c. E-learning ☐ percentage? ☐ d. Correspondence ☐ percentage? ☐ f. Other ☐ percentage? ☐ Comments:

B Objectives

1. The main objective of this course

After finishing this course students will be able to:

- Write the name of any fused heterocyclic compounds.
- Know the physical properties of different types of fused heterocyclic compounds.
- Describe and write the method of synthesis of any fused heterocyclic ring system.
- Understand the application of many fused heterocyclic rings in medicine, industry and in other fields.
- Understand current publications in heterocyclic 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)

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

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
Introduction, nomenclatures of fused heterocyclic rings, two fused ring systems, three fused ring systems, and poly fused ring systems.	3	9
Physical and chemical properties of different types of heterocyclic ring systems.	2	6
General methods for synthesis of different ring systems (by a number of cyclisation and cycloadditon reactions).	4	12

Uses of heterocyclic compounds as: marketing drugs, agrochemicals, dyes and pigments, fluorescent agents, antioxidants and food additives, corrosion inhibitors, fire retardant, photographic materials, organic conductors, catalysis.	4	12

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	**Knowledge**		
1.1	Define the molecular structures of different fused heterocyclic compounds	• Lectures • Scientific discussion • Web-based study • Library visits	• Exams • web-based student performance systems • portfolios • long and short
1.2	Describe the classification of heterocyclic compounds according to their different types		
1.3	Know the different methods for nomenclature of fused heterocyclic compounds		
1.4	Remember the multiple methods of preparation		

	of fused heterocyclic compounds		essays • posters
1.5	Recognize the chemical properties of different types of fused heterocyclic compounds		
1.6	Recognize the role of fused heterocyclic compounds in different field in our life.		
2.0	**Cognitive Skills**		
2.1	Development of reverse thinking skill (back thinking) and the student's acquiring the training skill to choose the suitable method for fused heterocyclic compounds preparation	• Lectures • Scientific discussion • Web-based study • Library visits	• Exams • web-based student performance systems • portfolios • long and short essays • posters • demonstrations
2.2	Making the student acquire the skill of naming any fused heterocyclic compounds		
2.3	The student acquiringof the skill of how to predict the outcomes of interactions of heterocyclic compounds		
2.4	The student can pick the appropriate methods for the preparation of fused heterocyclic compounds		
2.5	Design of different ways to nomenclature the heterocyclic compounds		
2.6	Student invents different ideas for the construction of bioactive fused heterocylic compounds.		
2.7	The student is planning to make a research program in the field of applied heterocyclic chemistry.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Develop the student's ability in self-reliance and responsibility.	• Lectures • Scientific discussion • Web-based study	• Exams • web-based student performance systems
3.2	Choose the suitable method to solve problems in selected topics in inorganic chemistry.		
3.3	Operate in team work and accept his college's opinions.		

4.0	**Communication, Information Technology, Numerical**		
4.1	Introductory lecture at the beginning of the semester to use the computer and the internet to search for sources of new researches and collect the researches which help in writing reports on topics related to syllabus.	• Lectures • Scientific discussion • Library visits • Web-based study	• Web-based student performance systems • Individual and group presentations
4.2	Evaluating the performance of the students through examination, duties and the discussion in the lecture which constitute 30% of the total evaluation.		
4.3	Introductory lecture at the beginning of the semester to use the computer and the internet to search for sources of new researches and collect the researches which help in writing reports on topics related to syllabus.		
5.0	**Psychomotor(if any)**		
5.1	Not applicable		
5.2			

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
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

- T. Eicher and S. Hauptmann, The Chemistry of Heterocycles" (2003).
- John A. Joule and Keith Mills, Heterocyclic Chemistry, 5th, Wiley-Blackwell, 2013.

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

- Alan Katritzky Tribute, Advances in Heterocyclic Chemistry, Volume 119, 2016.

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

- Questionnaires can be used to collect student feedback.
- Student representation on staff-student committees and institutional bodies.
- Structured group discussions and/or focus groups.

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

- Visits by other faculty can provide information about the process of teaching.
- Colleagues have the expertise to evaluate the quality of a course as evidenced by its content and format (peer reviewers.(
- 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.
- 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.

3. Procedures for Teaching Development

- The application of e-learning.
- Exchange of experiences internal and external.
- Review of strategies proposed.
- Providing new tools for learning.

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.

- Periodic review of the contents of the syllabus and modify the negatives.
- 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: **Prof. Dr. Thoraya A. Farghaly**
Signature: **Date Completed: 30 – 10 - 2018**
Program Coordinator: **Dr. Ismail Ibrahim Althagafi**

Signature: _____ **Date Received: 31/10/2018**

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Photochemistry**

Course Code: **402834-3**

Date: 31-10-2018	**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: **Photochemistry / 402834-3**
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: **Prof. Dr. Saleh A. Ahmed**
5. Level/year at which this course is offered: **3rd / 2nd**
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		percentage?	
b. Blended (traditional and online)		percentage?	80%
c. E-learning		percentage?	20%
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

By the end of this course student will be familiar with the basics of photochemistry and mechanisms of photochemical reactions as well as the applications of photochemistry in industry.

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)

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

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
Introduction to the basic principle photochemistry.	1	3
Different light sources and their uses, filters and the ranges of light. Fluorescence and phosphorescence.	2	3
The fate of excited states: physical processes (Jablonski diagram), chemical processes. General types of photochemical reactions.	2	3
Photo-reduction reactions, photochemical reactions of ethenes, polyethenes and ethynes,photodimerization of benzenoid compounds.	2	6
Photooxidation, photochemical aromatic substitution, photochemical fragmentation.	2	3
Common photochemical reactions and their kinetics.	2	6
Storage of solar energy and its conversions.	1	3
Photochemistry of vision.	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. Individualstudy/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	**Knowledge**		
1.1	Know the basic principles of photochemical reactions	• Lectures • Scientific discussion • Web-based study • Library visits	• Exams • web-based student performance systems • portfolios • long and short essays • posters
1.2	Determine the type of mechanism and intermediates in different photochemical reactions		
1.3	Write a mechanism for a photochemical transformation		
1.4	Write the products of photochemical reaction correctly		
1.5	Recognize the application of photochemistry		
1.6	Outline the general types of photochemical reactions		
1.7	Definethe different electronical excitation states		

1.8	Recognize the application of photochemistry		
2.0	**Cognitive Skills**		
2.1	Compare between different types of photochemical reactions	• Lectures • Scientific discussion • Web-based study • Library visits	• Exams • web-based student performance systems • portfolios • long and short essays • posters • demonstrations
2.2	Compare between different sources of light		
2.3	Apply the basic principles of photochemistry		
2.4	Predict the products of different photochemical reactions		
2.5	Formulate the outputs of different photochemical reactions		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Use the photochemical reactions to prepare different classes of organic molecules	• Lectures • Scientific discussion • Web-based study	• Exams • web-based student performance systems
3.2	Choose the suitable mechanism for a given photochemical reaction		
4.0	**Communication, Information Technology, Numerical**		
4.1	Evaluate the importance of photochemistry	• Lectures • Scientific discussion • Library visits • Web-based study	• Web-based student performance systems • Individual and group presentations
4.2	Evaluate the different photochemical reactions to synthesis of various organic compounds		
4.3	Demonstrate the mechanism of different photochemical reactions		
5.0	**Psychomotor(if any)**		
5.1	Not applicable		

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Mid-term exam	9	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

- **Persico, Maurizio, Granucci, Giovanni "Photochemistry; A Modern Theoretical Perspective", 1st ed., Springer International Publishing, 2018.**
- Photochemistry: Volume 38 by Angelo Albini, 2010.
- Modern Molecular Photochemistry of Organic Molecules by Nicholas J. Turro (2009).

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

- Lecture handouts available on the coordinator website.
- Photochemistry of Organic Compounds: From Concepts to Practice (Postgraduate Chemistry Series) by PetrKlán (2009).
- CRC Handbook of Organic Photochemistry and Photobiology, W. M. Horspool and F. Lenci., CRC Press, London, NY, 2003.

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

- Questionnaires can be used to collect student feedback.
- Student representation on staff-student committees and institutional bodies.
- Structured group discussions and/or focus groups.

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

- Observations and the assistance of colleagues.
- 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.
- Continuous training of member staff.
- Review of strategies proposed.
- 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.

- Periodic Review of the contents of the syllabus and modify the negatives.
- 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: **Prof. Dr. Saleh A. Ahmed**

Signature: **Date Completed: 31 - 10 - 2018**

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

Signature: _____ **Date Received: 31/10/2018**

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Advanced Polymer Chemistry**

Course Code: **402835-3**

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 / 402835-3**
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: **3rd / 2nd**
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		percentage?	
b. Blended (traditional and online)		percentage?	80%
c. E-learning		percentage?	20%
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

This course aimed to:

a. Having critical insight in the different methods to prepare polymers.
b. Being able to discuss relationships between different polymerization methods.
c. Knowing of parameters that control the polymerization reactions.
d. Getting acquainted with methods to build up complex polymer architectures.
e. 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	**Knowledge**		
1.1	Identify the basic principles of polymer morphology	• Lectures • Scientific	• Exams • web-based student

1.2	identify different methods to determine the absolute molecular weight of polymers	discussion • Web-based study • Library visits	performance systems • portfolios • long and short essays • posters
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		
2.0	**Cognitive Skills**		
2.1	Explain the polymers morphology.	• Lectures • Scientific discussion • Web-based study • Library visits	• Exams • web-based student performance systems • portfolios • long and short essays • posters
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.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Use the basic knowledge of organic chemistry to synthesis of different types of polymers.	• Lectures • Scientific discussion • Web-based study	• Exams • web-based student performance systems
3.2	Determine the absolute molecular weight of polymer molecules.		
3.3	Choose the suitable mechanism for a given polymerization reaction.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Evaluate the different modern methods to synthesis of polymeric materials.	• Lectures • Scientific discussion • Library visits • Web-based study	• Web-based student performance systems • Individual and group presentations
4.2	Demonstrate a synthetic pathways for synthesis of polymer molecules.		
4.3	Demonstrate the different applications of polymeric materials in industry.		
5.0	**Psychomotor(if any)**		
5.1	Not applicable		
5.2			

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
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

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Advanced Chemical Kinetics**

Course Code: **402836-3**

Date: 24-10-2018	**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 Chemical Kinetics / 402836-3**
2. Credit hours:**3 (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. Ahmed Fawzy**
5. Level/year at which this course is offered:**3rd / 2nd**
6. Pre-requisites for this course (if any): --
7. Co-requisites for this course (if any): --
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		percentage?	
b. Blended (traditional and online)	■	percentage?	90
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	10

Comments:

B Objectives

1. The main objective of this course

By the end of this course the students will be able to:

a. Describe the kinetics of complex reactions in the gas phase.

b. Develop the kinetics of photochemical reactions, explosions: autocatalysis and autocatalytic explosions

c. Write the kinetics of reactions in solution: factors affecting the rates of reactions in solution.

d. State the theories of reaction rates (collision theory, transition state theory).

e. Describe the homogeneous and heterogeneous reactions, elementary reactions, ionic reactions.

f. State the steady-state approximations.

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)

- Updating the course content with the techniques that will be recently introduced in the field.
- The use of smart teaching halls for lectures.
- Increased use of IT or web based reference material.
- Encourage students to carry out research reports in the subjects using the library, data base services, and/or websites.

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
Classification complex reactions in the gas phase.	1	3
Kinetics of complex reactions in the gas phase.	1	3
Kinetics of photochemical reactions, explosions and autocatalytic explosions.	2	6
Factors affecting the rates of reactions in solution.	1	3
Kinetics of reactions in solutions.	1	3
General revision and First Periodical Exam.	1	3
Theories of reaction rates (collision theory, transition state theory).	1	3
Homogeneous and heterogeneous reactions, elementary reactions, ionic reactions.	2	6

Steady-state approximations.	**2**	**6**
General revision and Second Periodical Exam.	**1**	**6**

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. Individualstudy/learning hours expected for students per week. 2 hours

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	Define the various types of complex reactions in the gas phase.	• Use of the internet to carry out some reports on course subjects. • Lectures • Discussion groups • Seminar • In class problems	• Written assignments • Presentations • Formal mid-term and final exams.
1.2	Understand the kinetics of complex reactions.		
1.3	Explain the kinetics of photochemical reactions and explosions.		
1.4	Describe the factors affecting the reactions in solutions and their kinetics.		
1.5	Describe steady-state approximations.		
1.6	Write on the theories of reaction rates.		
2.0	**Cognitive Skills**		
2.1	Compare between the different types of complex	• Web-based study.	• Measuring the

	reactions.	• Lectures. • Scientific discussion • Library visits.	response to the assignments. • Periodic tests and assignments.
2.2	Solve the rate-law expressions for different complex reactions.		
2.3	Give a concise interpretation of photochemical reactions and explosions.		
2.4	Interpret the kinetics of reactions in solutions and the factors affecting it.		
2.5	Compare between the two types of catalytic reactions.		
2.6	Discover the steady-state approximations.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Manage resources, time and collaborate with members of the group	• Teamwork groups for cooperative work making. • Solving problems in groups during lecture. • Open discussion about recent topic of the course	• Oral presentations • Group discussion • Reports
3.2	Use university library and web search engines for collecting information and search about different topics		
4.0	**Communication, Information Technology, Numerical**		
4.1	Work effectively both in a team, and independently on solving chemistry problems.	• Use digital libraries for literature survey • Use E-Learning Systems for the communication with lecturer through the course work	• Web-based student performance systems. • Individual and group presentations. • Evaluating the activities of the students through the semester .
4.2	Communicate effectively with his lecturer and colleagues		
4.3	Use information and communication technologies		
5.0	**Psychomotor(if any)**		
5.1	Not applicable		

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Assignments and activities.	--	10 %
2	Midterm Exam.	8	30 %
3	Final Exam.	15-16	60 %
4	Total	100%	

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)

- Availability of Staff members to provide counselling and advice.
- Office hours: During the working hoursweekly.
- Academic advisingforstudents.

E Learning Resources

1. List Required Textbooks

- An Introduction to Chemical Kinetics, Margaret Robson Wright, New York, John Wiley & Sons, 2004.
- Kinetics of Chemical Reactions, Guy Marin, Gregory S. Yablonsky, John Wiley, 2011.
- Muhammad Akhyar Farrukh, Advanced Chemical Kinetics, Forman Christian College, 2018.

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

- Lecture hand outs available on the coordinator website.

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

- http//:en.wikipedia.org/wiki/
- http//:www.chemweb.com/
- Websites on the internet relevant to the topics of the course

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

* Non

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.)

- Appropriate teaching class including white board and data show with at least 25 seats.

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

- Computer halls access for the students will be helpful in doing their tasks during the course.

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

- Noother requirements.

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching

- Student discussion with the instructor allow for continuous feedback through the course progress.
- Evaluation of student questionnaires.

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

- Discussions within the group of faculty teaching the course.
- Peer consultation on teaching strategies and its effectiveness.

3. Procedures for Teaching Development

- Workshops given by experts on new teaching and learning methodologies will be attended.

• Improving of the teaching strategies by monitoring the evaluation of the students progress through the semester
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) • Peer reviewing of random samples including periodic and final exams of the students will be done.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. • The course will be evaluated periodically after each semester based on the results of the students and the report presented by the teaching stuff that will be discussed with the course coordinator to improve the course.

Name of Course Instructor: **Dr. Ahmed Fawzy**

Signature: _____ Date Completed: 24 – 10 - 2018

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ Date Received: 25/10/2018

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Advanced Surface and Catalysis Chemistry**

Course Code: **402837-3**

Date: 29-10-2018	**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 Surface and Catalysis Chemistry / 402837-3**
2. Credit hours: **3 (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. **Prof. Abd El Rahman Salah Khder**
5. Level/year at which this course is offered: **3rd / 2nd**
6. Pre-requisites for this course (if any): --
7. Co-requisites for this course (if any): --
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		percentage?	
b. Blended (traditional and online)	■	percentage?	90
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	10

Comments:

B Objectives

1. The main objective of this course

The objectives of this course are to enable students to study in details the surface properties of Liquid- liquid, liquid-solid and gas –solid interfaces. Also the student will study homogeneous and heterogeneous catalysis and their applications in fine chemicals preparations and industrial applications.

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)

- Updating the course content with the techniques that will be recently introduced in the field.
- The use of smart teaching halls for lectures.
- Increased use of IT or web based reference material.
- Encourage students to carry out research reports in the subjects using the library, data base services, and/or websites.

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
Surface tension, liquid interface	1	3
Surface properties of liquids, work of Adhesion and cohesion. Surface films on liquid substrates (spreading of one liquid on another).	2	6
Solid surfaces, the surface area, BET equation	1	3
Adsorption isotherms, Langmuir adsorption theory. Physical adsorption-surface area measurements	2	6
Fundamentals of catalysis and types of catalysis	1	3
Homogenous catalysis the principles and applications of homogeneous catalysis in fine chemicals	2	6
Heterogeneous catalysis, the principles and applications, conversion and selectivity, catalyst deactivation.	2	6
Catalyst manufacture	2	6

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. Individualstudy/learning hours expected for students per week.

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	Determine the surface area of the solid from data of adsorption	• Use of the internet to carry out some reports on course subjects. • Lectures • Discussion groups • Seminar • In class problems	• Written assignments • Presentations • Formal mid-term and final exams.
1.2	Recognize the types of catalysis		
1.3	Write the methods of catalyst preparation		
2.0	**Cognitive Skills**		
2.1	Apply the adsorption equations to practical data	• Web-based study. • Lectures. • Scientific discussion • Library visits.	• Measuring the response to the assignments. • Periodic tests and assignments.
2.2	Compare between homogeneous and heterogeneous catalysis.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Manage resources, time and collaborate with members of the group	• Teamwork groups for cooperative work making.	• Oral presentations • Group discussion • Reports

3.2	Use university library and web search engines for collecting information and search about different topics	• Solving problems in groups during lecture. • Open discussion about recent topic of the course	
4.0	**Communication, Information Technology, Numerical**		
4.1	Work effectively both in a team, and independently on solving chemistry problems.	• Use digital libraries for literature survey • Use E-Learning Systems for the communication with lecturer through the course work	• Web-based student performance systems. • Individual and group presentations. • Evaluating the activities of the students through the semester .
4.2	Communicate effectively with his lecturer and colleagues		
4.3	Use information and communication technologies		
5.0	**Psychomotor(if any)**		
5.1	Not applicable		

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Assignments and activities.	--	10 %
2	Midterm Exam.	8	30 %
3	Final Exam.	15-16	60 %
4	Total		100%

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)
   - Availability of Staff members to provide counselling and advice.
   - Office hours: During the working hoursweekly.
   - Academic advisingforstudents.

E Learning Resources

1. List Required Textbooks
   - Catalysis Concepts and Green Applications, Gadi Rothenberg , John Wiley & Sons, 2008.
   - Industrial Catalysis: A Practical Approach, Second Edition. Jens Hagen WILEY VCH Verlag GmbH & Co. KGaA, Weinheim, 2006, ISBN: 3-527-31144-0.
2. List Essential References Materials (Journals, Reports, etc.)
   - Lecture hand outs available on the coordinator website.
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
   - http//:en.wikipedia.org/wiki/
   - http//:www.chemweb.com/

• Websites on the internet relevant to the topics of the course
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. * Non

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.) - Appropriate teaching class including white board and data show with at least 25 seats.
2. Technology resources (AV, data show, Smart Board, software, etc.) - Computer halls access for the students will be helpful in doing their tasks during the course.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) - Noother requirements.

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching • Student discussion with the instructor allow for continuous feedback through the course progress. • Student Evaluation Questionnaires.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • Discussions within the group of faculty teaching the course. • Peer consultation on teaching strategies and its effectiveness.
3. Procedures for Teaching Development • Workshops given by experts on new teaching and learning methodologies will be attended. • Improving of the teaching strategies by monitoring the evaluation of the students progress through the semester
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) • Peer reviewing of random samples including periodic and final exams of the students will be done.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. • The course will be evaluated periodically after each semester based on the results of the students and the report presented by the teaching stuff that will be discussed with the course coordinator to improve the course.

Name of Course Instructor: Prof. Abdel Rahman Salah Khder

Signature: _____ Date Completed: 29 – 10 - 2018

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ Date Received: 30/10/2018

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Advanced Electrochemistry**

Course Code: **402838-3**

Date: 27-10-2018	**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 Electrochemistry / 402838-3**
2. Credit hours: **3 (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. **Prof. Metwally Abdallah**
5. Level/year at which this course is offered: **3rd / 2nd**
6. Pre-requisites for this course (if any): --
7. Co-requisites for this course (if any): --
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		percentage?	
b. Blended (traditional and online)	■	percentage?	90
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	10

Comments:

B Objectives

1. The main objective of this course

By the end of this course students will be able to:

- Discuss the irreversible electrode processes.
- Explain how the current efficiency can be determined.
- Stratify the principles of electrical double layer and how the metal interacts with electrolytes.
- Discuss the different types of over potentials and how its measured.
- Understand thermodynamic of corrosion process, and how the corrosion process is controlled.

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)

- Updating the course content with the techniques that will be recently introduced in the field.
- The use of smart teaching halls for lectures.
- Increased use of IT or web based reference material.
- Encourage students to carry out research reports in the subjects using the library, data base services, and/or websites.

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
• Irreversible electrode processes.	1	3
• The current efficiency.	1	3
• Electrical double layer: structure of double layer, different types of double layer.	1	3
• Measurements of double layer capacity, electro capillary curves.	1	3
• Electro kinetics phenomena. Kinetics of electrode reaction.	1	3
• Activity coefficient, mass transport, ionic migration.	1	3
• Diffusion, theory of diffusion current.	1	3
• Electrolysis and overpotential.	1	3
• Different types of over potential, ohmicover potential, activation over potential, concentration over potential, IR drop.	1	6
• Modified electrode.	1	3
• Thermodynamic of corrosion process: change in Gibbs free energy, liquid junction potential, Pourbaix diagram.	1	3

• Corrosion control.	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.

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	Describe the role of electrochemistry in living systems.	• Use of the internet to carry out some reports on course subjects. • Lectures • Discussion groups • Seminar • In class problems	• Written assignments • Presentations • Formal mid-term and final exams.
1.2	Explain the experimental methods and tools used in electrochemistry.		
1.3	Mention the role of electrochemistry in industry.		
1.4	Determine the type of interaction between the metal ions and electrolytic solutions		
1.5	Write on the electrochemistry of aqueous solutions.		
2.0	**Cognitive Skills**		
2.1	Estimate the corrosion of the metals and alloys.	• Web-based study. • Lectures.	• Measuring the response to the assignments.
2.2	Report the corrosion inhibitors.		
	Design scientific methods and think to solve		

	problems concerning the course.	• Scientific discussion • Library visits.	• Periodic tests and assignments.
	Estimate the distinctive features of the organic and inorganic compounds as corrosion inhibitors		
	Apply the experimental methods and tools in electrochemistry.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Manage resources, time and collaborate with members of the group	• Teamwork groups for cooperative work making. • Solving problems in groups during lecture. • Open discussion about recent topic of the course	• Oral presentations • Group discussion • Reports
3.2	Use university library and web search engines for collecting information and search about different topics		
4.0	**Communication, Information Technology, Numerical**		
4.1	Work effectively both in a team, and independently on solving chemistry problems.	• Use digital libraries for literature survey • Use E-Learning Systems for the communication with lecturer through the course work	• Web-based student performance systems. • Individual and group presentations. • Evaluating the activities of the students through the semester .
4.2	Communicate effectively with his lecturer and colleagues		
4.3	Use information and communication technologies		
5.0	**Psychomotor(if any)**		
5.1	Not applicable		

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Assignments and activities.	--	10 %
2	Midterm Exam.	8	30 %
3	Final Exam.	15-16	60 %
4	Total	100%	

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)
   - Availability of Staff members to provide counselling and advice.
   - Office hours: During the working hours weekly.
   - Academic advising for students.

E Learning Resources

1. List Required Textbooks

- Electrochemistry, The Basics, With Examples, Christine Lefrou, Pierre Fabry, Jean-Claude Poignet, 2012, Speinger.
- Giridhar Sharma, Advanced Electrochemistry Hardcover, Amazon, 2017.

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

* Lecture hand outs available on the coordinator website.

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

- http//:en.wikipedia.org/wiki/
- http//:www.chemweb.com/
- Websites on the internet relevant to the topics of the course

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

* Non

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.)

- Appropriate teaching class including white board and data show with at least 25 seats.

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

- Computer halls access for the students will be helpful in doing their tasks during the course.

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 discussion with the instructor allow for continuous feedback through the course progress.
- Student Evaluation Questionnaires.

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

- Discussions within the group of faculty teaching the course.
- Peer consultation on teaching strategies and its effectiveness.

3. Procedures for Teaching Development

- Workshops given by experts on new teaching and learning methodologies will be attended.
- Improving of the teaching strategies by monitoring the evaluation of the students progress through the semester

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)

- Peer reviewing of random samples including periodic and final exams of the students will be done.

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

for developing it.

- The course will be evaluated periodically after each semester based on the results of the students and the report presented by the teaching stuff that will be discussed with the course coordinator to improve the course.

Name of Course Instructor: **Prof. Metwally Abdallah**

Signature: _____ **Date Completed:** **27 – 10 - 2018**

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

Signature: _____ **Date Received:** **28/10/2018**

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Physical Chemistry of Polymer**

Course Code: **402839-3**

Date: 30-10-2018	**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: **Physical Chemistry of Polymer / 402839-3**
2. Credit hours:**3 (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. **Prof. Mohamed Ismail Awad**
5. Level/year at which this course is offered:**3rd / 2nd**
6. Pre-requisites for this course (if any): --
7. Co-requisites for this course (if any): --
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		percentage?	
b. Blended (traditional and online)	■	percentage?	90
c. E-learning		percentage?	
d. Correspondence		Percentage?	
f. Other	■	percentage?	10

Comments:

B Objectives

1. The main objective of this course

- Students have an idea about basic concepts: of polymer liquids, molecular weight distributions.
- Throw the light on Flory's theory and scaling theory.
- Brief introduction on methods of polymer characterization.
- Account on mechanical properties of polymers.

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)

- Updating the course content with the techniques that will be recently introduced in the field.
- The use of smart teaching halls for lectures.
- Increased use of IT or web based reference material.
- Encourage students to carry out research reports in the subjects using the library, data base services, and/or websites.

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
Basic concepts: polymer liquids	1	3
Molecular weight distributions and critical concentrations.	1	3
Polymer ideal chains; molecular interactions and dimensions.	2	6
Polymer real chains; Flory's theory and scaling theory.	2	6
Methods of polymer characterization	2	6
Polymer thermodynamics: phase separation and phase diagrams.	2	6
Polymer glasses and the crystalline state.	1	3
Mechanical properties of polymers. Polymer dynamics.	2	6

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. Individualstudy/learning hours expected for students per week. 3 Hours

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	Know types of molecular interactions.	• Use of the internet to carry out some reports on course subjects. • Lectures • Discussion groups • Seminar • In class problems	• Written assignments • Presentations • Formal mid-term and final exams.
1.2	Know about phase separation and phase diagrams		
1.3	Mention types of polymer states		
1.4	Write about molecular weight distributions and critical concentrations		
2.0	**Cognitive Skills**		
2.1	Account for the molecular weight distributions in polymers	• Web-based study. • Lectures. • Scientific discussion • Library visits.	• Measuring the response to the assignments. • Periodic tests and assignments.
2.2	Compare molecular weights of polymer prepared by different methods		
2.3	Differentiate between stability of different polymers		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Manage resources, time and collaborate with members of the group	• Teamwork groups for cooperative work making. • Solving problems in groups during lecture. • Open discussion about recent topic of the course	• Oral presentations • Group discussion • Reports
3.2	Use university library and web search engines for collecting information and search about different topics		
4.0	**Communication, Information Technology, Numerical**		

4.1	Work effectively both in a team, and independently on solving chemistry problems.	• Use digital libraries for literature survey • Use E-Learning Systems for the communication with lecturer through the course work	• Web-based student performance systems. • Individual and group presentations. • Evaluating the activities of the students through the semester .
4.2	Communicate effectively with his lecturer and colleagues		
4.3	Use information and communication technologies		
5.0	**Psychomotor(if any)**		
5.1	Not applicable		

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

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)
   - Availability of Staff members to provide counselling and advice.
   - Office hours: During the working hoursweekly.
   - Academic advising forstudents.

E Learning Resources

1. List Required Textbooks
   - Sperling, L.H. Introduction to Physical Polymer 4-th Edition, Wiley 2005.
2. List Essential References Materials (Journals, Reports, etc.)
   - Lecture hand outs available on the coordinator website.
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
   - http//:en.wikipedia.org/wiki/
   - http//:www.chemweb.com/
   - Websites on the internet relevant to the topics of the course
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.
   - None

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.)
• Appropriate teaching class including white board and data show with at least 25 seats.
2. Technology resources (AV, data show, Smart Board, software, etc.)
• Computer halls access for the students will be helpful in doing their tasks during the course.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)
• Noother requirements.

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching
• Student discussion with the instructor allow for continuous feedback through the course progress. • Student Evaluation Questionnaires.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
• Discussions within the group of faculty teaching the course. • Peer consultation on teaching strategies and its effectiveness.
3. Procedures for Teaching Development
• Workshops given by experts on new teaching and learning methodologies will be attended. • Improving of the teaching strategies by monitoring the evaluation of the students progress through the semester
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)
• Peer reviewing of random samples including periodic and final exams of the students will be done.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it.
• The course will be evaluated periodically after each semester based on the results of the students and the report presented by the teaching stuff that will be discussed with the course coordinator to improve the course.

Name of Course Instructor: **Prof. Mohamed Ismail Awad**

Signature: _____ **Date Completed: 30 – 10 - 2018**

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

Signature: _____ **Date Received: 31/10/2018**

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Advanced Molecular Spectroscopy**

Course Code: **402840-3**

Date: 29-10-2018	**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 Molecular Spectroscopy / 402840-3**
2. Credit hours: **3 (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. Ahmed El Defrawy**
5. Level/year at which this course is offered: **3rd / 2nd**
6. Pre-requisites for this course (if any): --
7. Co-requisites for this course (if any): --
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		percentage?	
b. Blended (traditional and online)	■	percentage?	90
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	10

Comments:

B Objectives

1. The main objective of this course

The goal of course is to teach the symmetry principles needed to understand spectroscopic phenomena (such as the absorption of light) at a deeper level. In addition, it will cover the theoretical basis and applications of molecular spectroscopy as an important research tool to understand the different properties of the chemical compounds.

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)**

- Updating the course content with the techniques that will be recently introduced in the field.
- The use of smart teaching halls for lectures.
- Increased use of IT or web based reference material.
- Encourage students to carry out research reports in the subjects using the library, data base services, and/or websites.

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
Molecular symmetry	**3**	**9**
Rotational spectroscopy	**2**	**6**
Vibrational spectroscopy	**2**	**6**
Electronic spectroscopy	**2**	**6**
Nuclear magnetic resonance	**2**	**6**
Photoelectron spectroscopy and related techniques	**2**	**6**
Mossbour spectroscopy	**3**	**9**

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 Hours**

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	Define the symmetry and point groups for different molecules.	• Use of the internet to carry out some reports on course subjects. • Lectures • Discussion groups • Seminar • In class problems	• Written assignments • Presentations • Formal mid-term and final exams.
1.2	Explain the idea of energy states and the use of light to translate a chemical system between different available Eigen states		
1.3	Account for the relationship between the quantum mechanics as it applies to a chemical system and the nature of spectroscopic measurements		
1.4	Describe some of the important and timely current problems within the area of molecular spectroscopy in literature.		
2.0	**Cognitive Skills**		
2.1	Predict the symmetry and point groups of different molecules	• Web-based study. • Lectures. • Scientific discussion • Library visits.	• Measuring the response to the assignments. • Periodic tests and assignments.
2.2	Extract useful chemical information such as bonding and reactivity from spectroscopic data		
2.3	Apply appropriate scientific and reasoning to the analysis of spectroscopic obtained the field of molecular spectroscopy.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Manage resources, time and collaborate with	• Teamwork groups for	• Oral presentations

	members of the group	cooperative work making. • Solving problems in groups during lecture. • Open discussion about recent topic of the course	• Group discussion • Reports
3.2	Use university library and web search engines for collecting information and search about different topics		
4.0	**Communication, Information Technology, Numerical**		
4.1	Work effectively both in a team, and independently on solving chemistry problems.	• Use digital libraries for literature survey • Use E-Learning Systems for the communication with lecturer through the course work	• Web-based student performance systems. • Individual and group presentations. • Evaluating the activities of the students through the semester .
4.2	Communicate effectively with his lecturer and colleagues		
4.3	Use information and communication technologies		
5.0	**Psychomotor(if any)**		
5.1	Not applicable		

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Assignments and activities.	--	10 %
2	Midterm Exam.	8	30 %
3	Final Exam.	15-16	60 %
4	Total		100%

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)
   - Availability of Staff members to provide counselling and advice.
   - Office hours: During the working hours weekly.
   - Academic advising for students.

E Learning Resources

1. List Required Textbooks
- Jeanne L. McHale, Molecular Spectroscopy, 2nd Edition, CRC Press, 2017.
- J. Keeler, Understanding NMR Spectroscopy. John Wiley & Sons. 2005.
- Hüfner, Stephan, Photoelectron Spectroscopy, Principles and Applications, Springer, 2003.

2. List Essential References Materials (Journals, Reports, etc.)
- Lecture hand outs available on the coordinator website.

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

- http//:en.wikipedia.org/wiki/
- http//:www.chemweb.com/
- Websites on the internet relevant to the topics of the course

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

- Computational chemistry software packages will be considered whenever appropriate.

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.)

- **Appropriate teaching class including white board and data show with at least 25 seats.**

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

- Computer halls access for the students will be helpful in doing their tasks during the course.

3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

- Computational software will be helpful such as hyperchem program package.

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching

- Student discussion with the instructor allow for continuous feedback through the course progress.
- Student Evaluation Questionnaires.

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

- Discussions within the group of faculty teaching the course.
- Peer consultation on teaching strategies and its effectiveness.

3. Procedures for Teaching Development

- Workshops given by experts on new teaching and learning methodologies will be attended.
- Improving of the teaching strategies by monitoring the evaluation of the students progress through the semester

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)

- Peer reviewing of random samples including periodic and final exams of the students will be done.

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

- The course will be evaluated periodically after each semester based on the results of the students

and the report presented by the teaching stuff that will be discussed with the course coordinator to improve the course.

Name of Course Instructor: **Dr. Ahmed El Defrawy**

Signature: _____ **Date Completed: 29 – 10 - 2018**

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

Signature: _____ **Date Received:** **30/10/2018**

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: Mechanism of Inorganic Reactions

Course Code: 402841-3

Date: 23-10-2018	**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:**Mechanism of Inorganic Reactions / 402841-3**
2. Credit hours:**3 (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: **Prof. Nashwa Mahmoud El-Metwaly**
5. Level/year at which this course is offered:**3rd / 2nd**
6. Pre-requisites for this course (if any):**None**
7. Co-requisites for this course (if any):**None**
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		percentage?	
b. Blended (traditional and online)	■	percentage?	70%
c. E-learning	■	percentage?	20%
d. Correspondence		percentage?	
f. Other	■	percentage?	10%

Comments:

B Objectives

1. The main objective of this course

The aim is to teach students basic mechanisms for inorganic reaction types, such as: electron transfer reactions, ligand substitution reactions and migration & insertion reactions, outer -Inner shell mechanism, conditions of mechanism reactions. Students must know how to use inorganic reaction mechanisms available in the literature to solve chemical problems.

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)

- Problem solving skills, relating to qualitative and quantitative information
- E-Learning system is being introduced.
- Students can download course material which can be helpful for learning.
- Interpersonal skills, relating to the ability to interact with other people and to engage in team-working through group discussion.

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
• Types of reactions, complexes formation constants and kinetics of reactions	2	6
• Substitution reactions in square planer	1	3
• Factors affecting on rate of water exchange reactions	1	3
• Substitution reactions in octahedral. Trans effect in substitution reaction	2	6
• Possible mechanisms of ligand exchange reactions. Charge transfer reactions.	2	6
• Migration and insertion reactions, outer -Inner shell mechanism, conditions of mechanism	2	6
• Reactions of coordinated ligands. Photochemical reactions of complexes.	2	6
• Catalyzed substitution reactions, addition of protons to metals.	1	3

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	39	**3**	---	---	---	42
	Actual	39	**3**	---	---	---	42
Credit	Planned	3	---	---	---	---	3
	Actual	3	---	---	---	---	3

3. Individualstudy/learning hours expected for students per week. 3

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	Know types of reactions, complexes formation constants and kinetics of reactions.	• Class room lectures. • Individual handwritten assignments require use of library reference material and web sites to identify information required to complete tasks. • E-learning through university website.	• Written tests. • Evaluate effective participation of students during lectures. presentation. • Home work duties assigned in e-learning site.
1.2	Describe the substitution reactions in square planer.		
1.3	Know factors affecting on rate of water exchange reactions.		
1.4	Recognize the substitution reactions in octahedral and trans effect in substitution reaction.		
1.5	Explain possible mechanisms of ligand exchange reactions and charge transfer reactions.		
1.6	Distinguish migration and insertion reactions, outer -inner shell mechanism, conditions of mechanism.		

1.7	Memorize photochemical reactions of complexes.		
1.8	Know catalyzed substitution reactions, addition of protons to metals.		
2.0	**Cognitive Skills**		
2.1	Compare between reactions types, complexes formation constants and kinetics of reactions.	• Making connections between different concepts across the domains. • Assigning research questions that can be answered through collecting and analyzing data. • Summarizing the findings of online research • Using the instructor's webpage learning activities	• Solving general chemistry problems related to qualitative and quantitative information at the end of each topic. • Individual assignments or oral exam for developing/solving a task
2.2	Discover factors affecting on rate of water exchange reactions.		
2.3	Apply substitution reactions in octahedral and trans effect in substitution reaction		
2.4	Interpret migration and insertion reactions, outer -inner shell mechanism, conditions of mechanism.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Exceed ethics for communication with each others.	• Using Power Point (it's easy to cover more material quickly). • Group discussion. • Online workshops.	• Assessment of group assignment includes component for individual contribution.
3.2	Encourage students to use online resources.		
3.3	Motivate them to use Internet for collecting statistical data.		
3.4	Guide students to deal with Microsoft Office (e.g. Excel, Microsoft Access, front page) to analyze data and prepare statistical reports.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Able to communicate with his colleagues across all available tools.	• Debates learning • Group working. • Mini seminars prepared by the students to present their team projects. •	• Instructor's feedback during study. • Final and midterms exams include different problems need numerical and
4.2	Enrich the knowledge in information technology that will enable them to gather, interpret, and communicate information and ideas.		
4.3	Must have sufficient information about how to thinking to solve problems that will enable them		

	to apply in interpreting and proposing solutions.		technical skills
4.4	Communicate via the available electronic tools.		
4.5	Use of search engines across the Web.		
5.0	**Psychomotor(if any)**		
5.1	Not applicable.		
5.2			

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

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: 3 hours
- Total 3 hrs. of office hours for individual student consultations and academic advice per week in e-learning as mentioned before.

E Learning Resources

1. List Required Textbooks

- Rudi van Eldik and Colin D. Hubbard, "Inorganic Reaction Mechanisms"1st ed. Elsevier, 2017.
- Smiljko Ašperger, "Chemical Kinetics and Inorganic Reaction Mechanisms", 2nd ed., Springer, Boston, MA, 2003.

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

- Journal of Coordination Chemistry.
- Applied Organometallic Chemistry.

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

- http://onlinelibrary.wiley.com/book/10.1002/3527600825)
- http://www.chem.ox.ac.uk/icl/dermot/mechanism1/

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

- Isisdraw and Chemdraw and Chemoffice Software.
- http://scholle.oc.uni-kiel.de/herges/modeling/gliederung.html
- http://chem-faculty.ucsd.edu/trogler/GroupTheory224/Grouptheory.html
- http://phycomp.technion.ac.il/~ira/types.html

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.) • Smart classes are needed equipped with Internet access (scheduled for 3 hours once a week).
2. Technology resources (AV, data show, Smart Board, software, etc.) • Common computer lab containing at least 25 computer sets. • High speed internet access.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) • Required programs specific for chemistry students.

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching. • Confidential completion of standard course evaluation questionnaire. • Focused group discussion with small groups of students. • Review with the department chairman.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • Observations and assistance from colleagues. • Independent assessment of standards achieved by students. • Independent advice on assignment tasks.
3. Procedures for Teaching Development • Workshops on teaching methods. • Review of recommended teaching strategies.
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 by an independent member teaching staff of a sample of student work. • Periodic exchange and remarking of tests or a sample of assignments with staff at another institution.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. • Periodic revision of the course from concerned parties in the department and college, and improving it according to what is known in distinguished universities worldwide.

Name of Course Instructor: Prof. Nashwa Mahmoud El-Metwaly

Signature:  **-** **Date Completed: 23/10/2018**

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature:_____ **Date Received: 24/10/2018**

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: Spectroscopy and magnetism of inorganic compounds

Course Code: 402842-3

Date: 24-10-2018	**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: **Spectroscopy and magnetism of inorganic compounds / 402842-3**
2. Credit hours: **3 (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. Hoda Abou El-Fetouh El-Ghamry**
5. Level/year at which this course is offered:**3rd / 2nd**
6. Pre-requisites for this course (if any): **None**
7. Co-requisites for this course (if any): **None**
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		percentage?	
b. Blended (traditional and online)	■	percentage?	80%
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	20%

Comments:

B Objectives

1. The main objective of this course

- The students will learn the basic theories related to coordination chemistry such as: valance bond theory and crystal field theory, electronic spectroscopy will be also discussed.
- Let the students to be familiar with magnetism of compounds especially inorganic compounds.
- Special emphasis will be on electronic spin resonance including its techniques and the meaning of relaxation time and line width of and ESR spectra.
- Nuclear spin and hyperfine splitting will also be discussed.

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)

- Link the theoretical and practical sides of the course to give the students to understand and interpret the properties of the complexes.
- Variation of learning sources for the course, so that students benefit from more than one reference.
- The use of teaching intelligent classes for lectures.
- Encourage students to prepare reports include the preparation and chemical properties of coordination and organometallic compounds.

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
• Valence theories: valence bond theory, crystal field theory, ligand field theory.	2	6
• Electronic spectra: crystal field strength, electronic transition selection rules and d-d transitions on complexes.	2	6
• Para magnetism: the Curle law and zero-field.	1	3
• Long term order: molecular field theory of ferromagnetism and antiferromagnetism.	1	3

• Short term order: one-dimensional or linear chain systems, two-dimensional or planar systems.	**1**	**3**
• Some single ion and transition metal compounds properties.	**2**	**6**
• Electron spin resonance: interaction between electron spin resonance and magnetic field.	**2**	**6**
• Techniques of ESR spectroscopy.	**1**	**3**
• Relaxation time and line width of ESR Absorption.	**1**	**3**
• Nuclear spin and hyperfine splitting.	**1**	**3**

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	42	---	---	---	---	42
	Actual	42	---	---	---	---	42
Credit	Planned	3	---	---	---	---	3
	Actual	3	---	---	---	---	3

3. Individualstudy/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	**Knowledge**		
1.1	Explain the valence theories: valence bond theory, crystal field theory, ligand field theory.	• Lectures • Scientific discussion • Library visits	• Written mid-term and final exams. • Long and short
1.2	Describe the electronic spectra: crystal field		

	strength, electronic transition selection rules and d-d transitions on complexes.	• Web-based study	essays. • web-based student performance systems
1.3	Identify the para magnetism, ferromagnetism and antiferromagnetism		
1.4	Explain the electron spin resonance: interaction between electron spin resonance and magnetic field		
1.5	Describe the techniques of ESR spectroscopy.		
2.0	**Cognitive Skills**		
2.1	Compare between para magnetism, ferromagnetism and antiferromagnetism	• Lectures • Scientific discussion • Library visits • Web-based study	• Mid-term and final exams. • Measuring the response to the assignments.
2.2	Interpret the valence theories: valence bond theory, crystal field theory, ligand field theory		
2.3	Interpret the electronic spectra: crystal field strength, electronic transition selection rules and d-d transitions on complexes.		
2.4	Interpret the techniques of ESR spectroscopy		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Take the personality and responsibility for their own learning.	• Encourage the solving problems in groups during lecture. • Making open discussion about certain recent topic related to the course.	• Homeworks • Group reports.
3.2	Working effectively in groups and exercise leadership when appropriate		
3.3	Act ethically and consistently with high molar standards in personal and public forums		
3.4	Community linked thinking		
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicate effectively in oral and written forms.	• The use of computers in the training room of the department. • Organizing group visits to the Central Library. • The use of the	• Ask questions that test the student's ability to interpret simple statistical information. • Assess the duties associated with the proper use of
4.2	Use information and communication technologies.		
4.3	Use basic mathematical and statistical techniques.		

		international information network (internet).	communication skills and numerical process
5.0	**Psychomotor(if any)**		
5.1	Not applicable.		
5.2			

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

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)

- Academic advisingforstudents.
- Office hours: During the working hoursweekly.
- Availability of Staff members to provide counselling and advice.

E Learning Resources

1. List Required Textbooks

- Edward Maslowsky, "Vibrational Spectra of Organometallic Compounds", 1st ed., Wiley, 2018.
- Chandran Karunakaran, "Spin Resonance Spectroscopy, Principles and applications", 1st ed., Elsevier, 2018.

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

- Journal of magnetism and magnetic materials.
- Journal of magnetic resonance.

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

- https://www.abebooks.co.uk/book-search/title/magnetochemistry/author/carlin/
- http://link.springer.com/book/10.1007%2F978-1-349-18198-8

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

- None.

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.)

• Equipped lecture hall.
2. Technology resources (AV, data show, Smart Board, software, etc.) • Roomequippedwithcomputers, data show andTV.
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 • Questionnaires can be used to collect student feedback. • Student representation on staff-student committees and institutional bodies. • Structured group discussions and/or focus groups.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • Visits by other faculty can provide information about the process of teaching. • Colleagues have the expertise to evaluate the quality of a course as evidenced by its content and format (peer reviewers). • 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. • 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.
3. Procedures for Teaching Development • The application of e-learning. • Exchange of experiences internal and external. • Training programs and workshops for Staff member. • Providing new tools for learning.
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 by an independent member teaching staff of a sample of student work. • Periodic exchange and remarking of tests or a sample of assignments with staff at another institution.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. • Periodic review of the contents of the syllabus and modify the negatives. • 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. Hoda Abou El-Fetouh El-Ghamry

Signature: -  **Date Completed: 24/10/2018**

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ Date Received: 25/10/2018

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: Bioinorganic Chemistry

Course Code: 402843-3

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: **Bioinorganic Chemistry / 402843-3**
2. Credit hours: **3 (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: **Prof. Abdalla Mohamed Khedr**
5. Level/year at which this course is offered: **3rd / 2nd**
6. Pre-requisites for this course (if any): **None**
7. Co-requisites for this course (if any): **None**
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		percentage?	
b. Blended (traditional and online)	■	percentage?	80%
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	20%

Comments:

B Objectives

1. The main objective of this course

By the end of this course students will be able to:

a. Discuss the properties of biological molecules.

b. Explain how metal ions interact with biological environments and how these interaction influences the properties of metal centers.

c. Stratify principles of coordination chemistry to clarify how nature tailors properties of metal centers for specific applications.

d. Discuss the role of metal ions in medicine.

e. Understand current publications in the area of bioinorganic 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 bioinorganic chemistry 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
• Introduction to bioinorganic chemistry. Metal ions in living systems and biologically metals of high importance.	1	3
• Chemical and physical properties of biological molecules.	1	3
• Principles of coordination chemistry and distinctive features of the protein molecule as a ligand.	1	3
• Structure and properties of metaloproteins in electron transport processes.	1	3
• Experimental methods and tools used in bioinorganic chemistry.	1	3

• Bioinorganic chemistry of alkali and alkaline-earth metal ions.	**1**	**3**
• Bioinorganic chemistry of iron.	**1**	**3**
• Bioinorganic chemistry of copper.	**1**	**3**
• Bioinorganic chemistry of zinc and the most important proteins of zinc.	**1**	**3**
• Bioinorganic chemistry of other metal ions.	**1**	**3**
• Contamination by inorganic chemicals.	**1**	**3**
• Interaction of heavy metal ions with biomolecules.	**2**	**6**
• Role of metals in medicine.	**1**	**3**

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	42	---	---	---	---	42
	Actual	42	---	---	---	---	42
Credit	Planned	3	---	---	---	---	3
	Actual	3	---	---	---	---	3

3. Individualstudy/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	**Knowledge**		

1.1	Describe the role of metal ions in living systems.	• Lectures • Scientific discussion • Use the library to work duties and a small research on bioinorganic chemistry. • Use of the internet to carry out some reports on course subjects.	• Written mid-term and final exams. • Long and short essays.
1.2	Explain the experimental methods and tools used in bioinorganic chemistry.		
1.3	Mention the role of metals in medicine.		
1.4	Determine the type of interaction between heavy metal ions and biomolecules.		
1.5	Write on the bioinorganic chemistry of alkali and alkaline-earth metal ions.		
2.0	**Cognitive Skills**		
2.1	Estimate the metals of high biologically importance.	• Lectures • Scientific discussion • Library visits • Web-based study	• Mid-term and final exams. Measuring the response to the assignments.
2.2	Report the structure and properties of metalloproteins.		
2.3	Design scientific methods and think to solve problems concerning the course.		
2.4	Estimate the distinctive features of the protein molecule as a ligand.		
2.5	Apply the experimental methods and tools in bioinorganic chemistry		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Operate in team work and accept his college's opinions.	• Dividing students into groups to carry out collective scientific reports. • Periodic individual duties to develop the skill of taking responsibility and self-reliance.	• Evaluate the results of collective works and duties as well as knowing the contribution of each individual through dialogue and discussion. • Assessment of individual tasks and duties to determine the student's ability to self-reliance.
3.2	Choose the suitable method to solve problems.		
3.3	Develop the student's ability in self-reliance and responsibility.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Use computers and the international	• Visiting research	• Evaluation of the

	information network (the Internet) to perform calculations and to identify recent research relevant to decision sources.	centers. • The use of computers in the training room of the department. • Using the internet for collecting data.	duties associated with the proper use of numerical and communication skills. • Web-based student performance systems. • Individual and group presentations.
4.2	Communicate effectively in oral and written forms.		
4.3	Use basic mathematical and statistical techniques to perform data analysis.		
5.0	**Psychomotor(if any)**		
5.1	Not applicable.		
5.2			

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	**Assignments and activities.**	**--**	**10 %**
2	**Midterm Exam.**	**8**	**30 %**
3	**Final Exam.**	**15-16**	**60 %**
4	**Total**	**100 %**	

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)

- Availability of Staff members to provide counselling and advice.
- Office hours: During the working hoursweekly.
- Academic advisingforstudents.

E Learning Resources

1. List Required Textbooks

- Toshikazu Hirao and Toshiyuki Moriuchi, "Advances in Bioorganometallic Chemistry", 1st ed., Elsevier, 2018.
- Dieter Rehder, "Bioinorganic Chemistry", 1st ed., Oxford University Press, 2014
- W. Kaim, B. Schwederski and A. Klein, *Bioinorganic Chemistry -- Inorganic Elements in the Chemistry of Life: An Introduction and Guide*, 2nd Edition, Wiley, New York, 2013.
- J.J.R.F. Da Silva and R.J.P. Williams, *The Biological Chemistry of the Elements: the Inorganic Chemistry of Life*, Oxford University Press, Oxford, 2001.

•
2. List Essential References Materials (Journals, Reports, etc.) • Journal of Inorganic Biochemistry. • Bioinorganic Chemistry and Applications.
3. List Electronic Materials, Web Sites, Facebook, Twitter, etc. • http://nsdl.niscair.res.in/jspui/ • http://www.chemistry.uoc.gr/ • http://www.chemie.uni-hamburg.de/
4. Other learning material such as computer-based programs/CD, professional standards or regulations and software. • None.

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.) • Smart classes are needed equipped with Internet access (scheduled for 3 hours once a week).
2. Technology resources (AV, data show, Smart Board, software, etc.) • Roomequippedwithcomputers, data show andTV.
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 • Confidential completion of standard course evaluation questionnaire. • Focused group discussion with small groups of students.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • Visits by other faculty can provide information about the process of teaching. • Colleagues have the expertise to evaluate the quality of a course as evidenced by its content and format (peer reviewers). • 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. • 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.
3. Procedures for Teaching Development • Providing new tools for learning. • Exchange of experiences internal and external. • Training programsand workshops for Staff member. • Review of strategies proposed. • The application of e-learning.

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) • Periodic exchange and remarking of tests or a sample of assignments with staff at another institution. • Check marking by an independent member teaching staff of a sample of student work.
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. • Periodic review of the contents of the syllabus and modify the negatives.

Name of Course Instructor: Prof. Abdalla Mohamed Khedr

Signature: - **Date Completed: 21/10/2018**

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ **Date Received: 22/10/2018**

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Electroanalytical Chemistry**

Course Code: **402844-3**

Date: 29-10-2018	**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: **Electroanalytical Chemistry / 402844-3**			
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: **3rd / 2nd**			
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		percentage?	
b. Blended (traditional and online)	■	percentage?	80%
c. E-learning	■	percentage?	20%
d. Correspondence		percentage?	
f. Other		percentage?	
Comments:			

B Objectives

1. The main objective of this course

By the end of this course, students able to understand the fundamental principles of electrochemistry and electrochemical methods of analysis. Also, The student will learn about the theoretical aspects of electrochemical measurements whether they are used for determining some physical properties of a system or for detecting an analyte.

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)

- The use of smart teaching halls for lectures.
- Encourage students to carry out research reports in the advance physical chemistry related subjects using the library, data base services, and/or websites.
- Changes in content as a result of new research in the field.
- 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
• The fundamental principles of electrochemistry and electrochemical methods of analysis.	2	6
• The theoretical aspects of electrochemical measurements whether they are used for determining some physical properties of a system or for detecting an analyte.	2	6
• Structure of electrode interface and the diffusion.	1	3
• Linear and cyclic voltammetry.	2	6
• Polarography and potentiometry (ion selective electrode).	1	3
• Potential step methods and Differential- and square-wave.	1	3
• Stripping voltammetry, coulometry, conductometric and amperometric analysis.	2	6

• Hydrodynamic voltammetry, rotating electrode technique	**1**	**3**
• Electrochemical impedance spectroscopy.	**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	• Understand the fundamental principles of electrochemistry and electrochemical methods of analysis.	• Lectures • Scientific discussion • Use the library to work duties and a small research on electroanalytical	• Written mid-term and final exams. • Long and short essays.
1.2	• Describe thestructure of electrode interface.		
1.3	• Write about polarography and potentiometry.		

1.4	• Identify theoretical aspects of electrochemical measurements whether they are used for determining some physical property a system or for detecting an analyte.	Chemistry. • Use of the internet to carry out some reports on course subjects.	
1.5	• Explain scientific basis of the hydrodynamic voltammetry.		
1.6	• Outline the rotating electrode technique and electrochemical impedance spectroscopy.		
1.7	• Recording the relation betweendifferential- and square-wave voltammetry.		
1.8	• Compare between Linear and cyclic voltammetry.		
2.0	**Cognitive Skills**		
2.1	• Interpret the theoretical aspects of electrochemical measurements whether they are used for determining some physical property a system or for detecting an analyte.	• Lectures • Scientific discussion • Library visits • Web-based study • Using brain storming at the beginning of each lecture in order to stimulate the students towards the new topic of the course. • Enhancing open discussion during the lecture.	• Mid-term and final exams. • Measuring the response to the assignments. • Through assignments and homework
2.2	• Discoverthe potential step methods.		
2.3	• Apply a rotating electrode technique.		
2.4	• Modify the electrochemical impedance spectroscopy.		
2.5	• Formulate the relation linear and cyclic voltammetry.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	• Operate in team work and accept his college's opinions.	• Dividing students into groups to carry out collective scientific reports.	• Evaluate the results of collective works and duties as well
3.2	• Choose the suitable method to solve problems.		

3.3	• Develop the student's ability in self-reliance and responsibility.	• Periodic individual duties to develop the skill of taking responsibility and self-reliance.	as knowing the contribution of each individual through dialogue and discussion. • Assessment of individual tasks and duties to determine the student's ability to self-reliance.
4.0	**Communication, Information Technology, Numerical**		
4.1	• Use computers and the international information network (the Internet) to perform calculations and to identify recent research relevant to decision sources.	• Visiting research centers. • The use of computers in the training room of the department. • Using the internet for collecting data.	• Evaluation of the duties associated with the proper use of numerical and communication skills. • Web-based student performance systems. • Individual and group presentations.
4.2	• Communicate effectively in oral and written forms.		
4.3	• Use basic mathematical and statistical techniques to perform data analysis.		
5.0	**Psychomotor(if any)**		
5.1	Not applicable.		

5. Assessment Task Schedule for Students During the Semester			
	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	**Week Due**	**Proportion of Total Assessment**
1	Assignments and activities.	--	10 %
2	Midterm Exam.	8	30 %

3	Final Exam.	15-16	60 %
4	**Total**	**100 %**	

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

- A.J. Bard and L. R. Faulkner, *Electrochemical Methods: Fundamentals and Applications,* John Wiley and Sons., 2nd ed. 2001
- Fundamentals of Electroanalytical Chemistry, Paul M. S. Monk, Manchester Metropolitan University, Manchester, UK, 2001.

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

- Journal of Electroanalytical Chemistry.
- Journal of Analytical Chemistry.

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

- http://nsdl.niscair.res.in/jspui/
- http://www.chemistry.uoc.gr/
- http://www.chemie.uni-hamburg.de/

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

- None.

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.)
- Equipped lecture hall equipped specializing in electroanalytical chemistry.

2. Technology resources (AV, data show, Smart Board, software, etc.)
- Room equipped with computers, data show 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
- Structured group discussions and/or focus groups.

- Questionnaires can be used to collect student feedback. - Student representation on staff-student committees and institutional bodies.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department - 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. - 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. - Visits by other faculty can provide information about the process of teaching. - Colleagues have the expertise to evaluate the quality of a course as evidenced by its content and format (peer reviewers).
3. Procedures for Teaching Development - Providing new tools for learning. - The application of e-learning. - Exchange of experiences internal and external. - Training programsand workshops for Staff member. - Review of strategies proposed.
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 by an independent member teaching staff of a sample of student work. - Periodic exchange and remarking of tests or a sample of assignments with staff at another institution.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. - Workshops for teachers of the course. - Periodic review of the contents of the syllabus and modify the negatives. - Consult other staff of the course. - Hosting a visiting staff to evaluate of the course.

Name of Course Instructor: Dr. Mohammed Ahmed Kassem

Signature: _____ Date Completed: 29 – 10 - 2018

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ Date Received: 30/10/2018

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Chromatography**

Course Code: **402845-3**

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 / 402845-3**			
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: **3rd / 2nd**			
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		percentage?	
b. Blended (traditional and online)	■	percentage?	80%
c. E-learning	■	percentage?	20%
d. Correspondence		percentage?	
f. Other		percentage?	
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 isotachophoresis.	**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.	• Lectures • Scientific discussion • Use the library to work duties and a small research on Chromatography. • Use of the internet to carry out some reports on course subjects.	• Written mid-term and final exams. • Long and short essays.
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.		
2.0	**Cognitive Skills**		
2.1	Modify the capillary isoelectric focusing its analytical applications.	• Lectures • Scientific discussion • Library visits • Web-based study • Using brain storming at the beginning of each lecture in order to stimulate the students towards the new topic of the course. • Enhancing open discussion during	• Mid-term and final exams.Measuring the response to the assignments. • Through assignments and homework
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.	
3.0	**Interpersonal Skills & Responsibility**		
3.1	Operate in team work and accept his college's opinions.	• Dividing students into groups to carry out collective scientific reports. • Periodic individual duties to develop the skill of taking responsibility and self-reliance.	• Evaluate the results of collective works and duties as well as knowing the contribution of each individual through dialogue and discussion. • Assessment of individual tasks and duties to determine the student's ability to self-reliance.
3.2	Choose the suitable method to solve problems.		
3.3	Develop the student's ability in self-reliance and responsibility.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Use computers and the international information network (the Internet) to perform calculations and to identify recent research relevant to decision sources.	• Visiting research centers. • The use of computers in the training room of the department. • Using the internet for collecting data.	• Evaluation of the duties associated with the proper use of numerical and communication skills. • Web-based student performance systems. • Individual and group presentations.
4.2	Communicate effectively in oral and written forms.		
4.3	Use basic mathematical and statistical techniques to perform data analysis.		
5.0	**Psychomotor(if any)**		
5.1	Not applicable.		

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

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 stationaryphase 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 chromatographymode. 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, ArshadKhuroo, NageshwarR.Thudi, SimritReyar, ArunKumar,Manoj S Tomar, Rakesh Jain, Nand Kumar and TausifMonif, 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.)

• Equipped lecture hall equipped specializing in chromatography.
2. Technology resources (AV, data show, Smart Board, software, etc.) • Room equipped with computers, data show 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 • Structured group discussions and/or focus groups. • Questionnaires can be used to collect student feedback. • Student representation on staff-student committees and institutional bodies.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • 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. • 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. • Colleagues have the expertise to evaluate the quality of a course as evidenced by its content and format (peer reviewers).
3. Procedures for Teaching Development • Providing new tools for learning. • The application of e-learning. • Exchange of experiences internal and external. • Training programs and workshops for Staff member.
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 by an independent member teaching staff of a sample of student work. • Periodic exchange and remarking of tests or a sample of assignments with staff at another institution.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. • Workshops for teachers of the course. • Periodic review of the contents of the syllabus and modify the negatives. • Hosting a visiting staff to evaluate of the course.

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

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Environmental Chemistry**

Course Code: **402846-3**

Date: 28-10-2018	**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: **Environmental Chemistry / 402846-3**
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: **Prof. Amr Lotfy Saber**
5. Level/year at which this course is offered: **3rd / 2nd**
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		percentage?	
b. Blended (traditional and online)	■	percentage?	100%
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

By completing this course, the students will be able to:

- Know the air, water and soil pollution and their monitoring.
- Describe the chemical composition of atmosphere, chemical and photochemical reaction in atmosphere.
- Classify various air pollutants and their chemistry and analytical methods for the analysis of various air pollutants.
- Use analytical methods for the determination different pollutants such as fertilizers, pesticides, plastics and heavy metals.
- Compare between analytical methods for estimation of various water pollutants, purification and treatment of water.

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

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
Introduction of atmosphere, chemical composition of atmosphere, chemical and photochemical reaction in atmosphere	**1**	**3**
Smog formation, oxides of N, S, C, O and their effect, acid rain, pollution by chemicals, minerals etc., ozone destruction by halogenated species,other various air pollutants and their chemistry	**2**	**6**
Analytical methods for the analysis of various air pollutants	**2**	**6**

Introduction to hydrological cycle, chemical composition of water bodies like lake, rivers, stream etc. Water chemistry and weathering regimes (Alkalinity, dissolved inorganic carbon and pH buffering).	**1**	**3**
Role of various water pollutants (for example: Aluminium solubility and acidity, heavy metal contamination, iron as a nutrient in the oceans) in water pollution	**1**	**3**
Analytical methods for estimation of various water pollutants, purification and treatment of water	**2**	**6**
Formation of soils (soil sampling, soil texture, composition of soil, macro and micro nutrients, soil pH)	**1**	**3**
Pollution based on fertilizers, pesticides, plastic, heavy metals, and organic contaminants in soils	**1**	**3**
Analytical methods for the determination of each pollutant in different soil samples.	**1**	**3**
Revision	**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. Individualstudy/learning hours expected for students per week. 3 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	Recognize air, water, soil pollution and monitoring.	• Lectures • Scientific discussion • Library visits • Web-based study • Using open discussion to link the previous knowledge to the current and future topics • The students use the internet to prepare an essay about a recent advances related to the course	• Exams • web-based student performance systems • portfolios • long and short essays
1.2	Identify chemical composition of atmosphere, chemical and photochemical reaction in atmosphere.		
1.3	Define smog formation, oxides of N, S, C, O and their effect.		
1.4	Discuss thevarious air pollutants and their chemistry and analytical methods for the analysis of various air pollutants.		
1.5	Know the hydrological cycle, chemical composition of water bodies like lake, rivers, stream.		
1.6	Recognize the role of various water pollutants in water quality, analytical methods for estimation of various water pollutants, purification and treatment of water.		
1.7	Outline the composition of soil, macro and micro nutrients, pollution based on fertilizers, pesticides, plastics and heavy metals, analytical methods for the determination of each pollutant.		
2.0	**Cognitive Skills**		
2.1	Design the suitable procedures to identify the chemical composition air pollutants	• Lectures • Scientific discussion • Library visits • Web-based study • Using brain storming at the beginning of each lecture in order to stimulate the students towards the new topic of the course. • Enhancing open discussion during the lecture.	• Exams • web-based student performance systems • portfolios • long and short essays • Through assignments and homework.
2.2	Apply the suitable analytical methods to analysis the different air samples.		
2.3	Formulate the different types of pollutants		
2.4	Confirm the suitable methods to detect the pollutants in water and soil samples		
2.5	Design the suitable procedures to identify the chemical composition air pollutants		

3.0	**Interpersonal Skills & Responsibility**		
3.1	Take the personality and responsibility for their own learning.	• Encourage the solving problems in groups during lecture. • Making open discussion about certain recent topic of the course.	Homework and group reports
3.2	Work effectively in groups and exercise leadership when appropriate.		
3.3	Act ethically and consistently with high molar standards in personal and public forums.		
3.4	Community linked thinking		
4.0	**Communication, Information Technology, Numerical**		
4.1	Communicate effectively in oral and written forms.	• Lectures • Scientific discussion • Library visits • Web-based study	• Exams • web-based student performance systems • portfolios • long and short essays
4.2	Use information and communication technologies		
4.3	Use basic mathematical and statistical techniques.		
5.0	**Psychomotor(if any)**		
5.1	NOT APPLICABLE		
5.2			

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

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 counselling and advice.
- Office hours: During the working hours weekly.
- Academic advising for students.

E Learning Resources

1. List Required Textbooks

1- J.E. Andrews, P. Brimblecombe, T.D. Jickells, P.S. Liss and B. Reid "An Introduction to Environmental Chemistry" 2nd edition Copyright © © 2004 by Blackwell Science Ltd a Blackwell Publishing company.

2- Eric Lichtfouse, Jan Schwarzbauer, Didier Robert "Environmental Chemistry (Green Chemistry and Pollutants in Ecosystems), Copyright © Springer-Verlag Berlin Heidelberg 2005, Printed in Germany.

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

- Lecture Handouts available on the coordinator website.

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.
- None.

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.)

- Equipped classrooms.

2. Technology resources (AV, data show, Smart Board, software, etc.)
- Room equipped with computer and 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

- Complete the questionnaire evaluation of the course in particular

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

- Observations and the assistance of colleagues.

• Independent evaluation forextenttoachieve students the standards. • Independent adviceofthe dutiesandtasks.
3. Procedures for Teaching Development • Workshops for teaching methods. • Continuous training of member staff. • 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. • Periodic review of the contents of the syllabus and modify the negatives. • Hosting a visiting staff to evaluate of the course. • Workshops for teachers of the course.

Name of Course Instructor: Prof. Amr Lotfy Saber_____

Signature: _____ **Date Completed:** ___28/10/2018_____

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ **Date Received: 29/10/2018**

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Chemometrics and Data Analysis**

Course Code: **402847-3**

Date: 23-10-2018	**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: **Chemometrics and Data Analysis / 402847-3**
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. Amr Lotfy Saber**
5. Level/year at which this course is offered: **3rd / 2nd**
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		percentage?	
b. Blended (traditional and online)	■	percentage?	100%
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

By completing this course, the students will be able to:

- Understand the quality of analytical measurements.
- Know the relation between model and data; experimental design and optimization.
- The course also will cover multivariate mixture analysis and multivariate image analysis of hyper-spectral images.

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
• Chemical data analysis: bias and precision, statistics of repeated measurements, normal distribution and properties, significant tests.	1	3
• Quality of analytical measurements; Calibration methods: Regression and correlation, confidence limits, limit of decision, limit of detection, standard additions.	2	6
• Non-parametric and robust methods (Box and Whisker plot).	1	3
• The relation between model and data; Experimental design and Optimization: Two-way analysis of variance (ANOVA), one-way analysis of variance (ANOVA).	2	6
• Multivariate data analysis: Principal component analysis, dendograms.	1	3

• Applications of analytical techniques in research and development.	**1**	**3**
• Fundamentals of many commonly used chemometric methods including exploratory data analysis, pattern recognition.	**2**	**6**
• Regression and classification methods (PCA, PLS, SIMCA,PLS-DA).	**1**	**3**
• Multivariate mixture analysis and multivariate image analysis of hyper-spectral images.	**2**	**6**
• Revision	**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. 3 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 calibration methods: Regression and correlation, confidence limits, limit of decision, limit of detection and standard additions.	• Lectures • Scientific discussion • Use the library to work duties and a	• Written mid-term and final exams. • Long and short
1.2	Describe the chemical data analysis: bias and precision.		

1.3	Understand the Quality of analytical measurements.	small research on chemomatrices and data analysis. • Use of the internet to carry out some reports on course subjects.	essays.
1.4	Write about applications of analytical techniques in research and development.		
1.5	Explain the two-way analysis of variance (ANOVA)		
1.6	Outline the multivariate data analysis and principal component analysis.		
1.7	Recording the relation between model and data.		
2.0	**Cognitive Skills**		
2.1	Report a multivariate mixture analysis and multivariate image analysis of hyper spectral images.	• Lectures • Scientific discussion • Library visits • Web-based study • Using brain storming at the beginning of each lecture in order to stimulate the students towards the new topic of the course. • Enhancing open discussion during the lecture.	• Exams • web-based student performance systems • portfolios • long and short essays • Through assignments and homework.
2.2	Interpret the deference between non-parametric and robust methods (Box and Whisker plot).		
2.3	Construct amultivariate data analysis.		
2.4	Modify the quality of analytical measurements.		
2.5	Confirm the relation between model and data.		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Operate in team work and accept his college's opinions.	• Dividing students into groups to carry out collective scientific reports. • Periodic individual duties to develop the skill of taking responsibility and self-reliance.	• Evaluate the results of collective works and duties as well as knowing the contribution of each individual through dialogue and discussion. • Assessment of individual tasks and duties to determine the student's ability
3.2	Choose the suitable method to solve problems.		
3.3 Develop the student's ability in self-reliance and responsibility.			

			to self-reliance.
4.0	**Communication, Information Technology, Numerical**		
4.1	Use computers and the international information network (the Internet) to perform calculations and to identify recent research relevant to decision sources.	• Visiting research centers. • The use of computers in the training room of the department. • Using the internet for collecting data.	• Evaluation of the duties associated with the proper use of numerical and communication skills. • Web-based student performance systems. • Individual and group presentations.
4.2	Communicate effectively in oral and written forms.		
4.3	Use basic mathematical and statistical techniques to perform data analysis.		
5.0	**Psychomotor(if any)**		
5.1	NOT APPLICABLE		

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

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 counselling and advice.
- Office hours: During the working hours weekly.
- Academic Advising for students.

E Learning Resources

1. List Required Textbooks
- *Chemometrics: Data Analysis for the Laboratory and Chemical Plant,* Richard G. Brereton, 2003, Wiley.
- *Chemometrics with R Multivariate Data Analysis in the Natural Sciences and Life Sciences*, Ron Wehrens auth.2011, Springer Heidelberg Dordrecht London New York.

2. List Essential References Materials (Journals, Reports, etc.)
- Matthias Otto, "Chemometrics: Statistics and Computer Application in Analytical Chemistry", 3rd ed., Wiley-VCH, 2016.

3. List Electronic Materials, Web Sites, Facebook, Twitter, etc.
- www.spectroscopynow.com.
- www.statsoft.com/textbook/stathome.html.
- http://davidmlane.com/hyperstat/.
- www.psychstat.smsu.edu/MultiBook/mlt00.htm.

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.
None

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.)

- Equipped lecture hall equipped specializing in chemometrics and data analysis.

2. Technology resources (AV, data show, Smart Board, software, etc.)
- Room equipped with computer and 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

- Structured group discussions and/or focus groups.
- Questionnaires can be used to collect student feedback.
- Student representation on staff-student committees and institutional bodies.

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

- 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.
- 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.
- Visits by other faculty can provide information about the process of teaching.
- Colleagues have the expertise to evaluate the quality of a course as evidenced by its content and format (peer reviewers).

3. **Procedures for Teaching Development**

- Providing new tools for learning.
- The application of e-learning.
- Exchange of experiences internal and external.
- Training programs and workshops for Staff member.
- Review of strategies proposed.

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 by an independent member teaching staff of a sample of student work.
- Periodic exchange and remarking of tests or a sample of assignments with staff at another institution.

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

- Workshops for teachers of the course.
- Periodic review of the contents of the syllabus and modify the negatives.
- Consult other staff of the course.
- Hosting a visiting staff to evaluate of the course.

Name of Course Instructor: ____Prof. Amr Lotfy Saber_____
Signature: _____ Date Completed: ___23/10/2018_____
rogram Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ Date Received: 24/10/2018

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: Nanomaterials and Hybrid Materials

Course Code: 402849-3

Date: 14-2-2019	**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: **Nanomaterials and Hybrid Materials / 402849-3**
2. Credit hours: **3 (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: **Prof. Abd El Rahman Khedr**
5. Level/year at which this course is offered: **3rd / 2nd**
6. Pre-requisites for this course (if any): **None**
7. Co-requisites for this course (if any): **None**
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		percentage?	
b. Blended (traditional and online)		percentage?	100
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

Make the students acquainted to the basic concept of nano and hybride materials and changes of chemical and physical properties due size reduction, and the terminology related to science, nanomaterials and nanotechnology. The students will study the methods of preparation, the most recent tools of nanomaterials characterization, the applications and fictionalization of nanomaterialsand hybride materials

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)

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.

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
• General introduction and history of nanotechnology. • Importance of the nanoparticles in industries and in our lives.	1	3
• Approaches in nanotechnology and typical syntheses of nanoparticles. • Properties of nanomaterials, chemical and physical property. • Reasons for changing the properties.	3	9
• Methods of preparation of other nano-formulations such as mesoporous, MOF,….. materials and their properties	2	6
• Spectroscopic and microscopic tools used in nanomaterials characterizations • General industrial applications for nanoscale systems and fixtures, nano-optic applications, bio-nanotechnology applications and medical nanotechnology applications • Nanotechnology and clean technologies: What is a clean technology challenges facing us in the areas of energy, water and environment, exploring the contribution of nanotechnology to solve these problems, the current obstacles faced by nanotechnology.	2	6

• Hybrid materials in nature • Development of hybrid materials • Classification • Distinction between nanocomposites and hybrid materials • Advantages of hybrid materials over traditional composites • Hybrid Composite Materials • Inorganic/Organic Hybrids • Hybridization of Functions • New Classification of Hybrid Materials	3	9
• Synthesis • Building block approach • In situ formation of the components • 1In situ formation of inorganic materials • Formation of organic polymers in presence of preformed inorganic materials • Hybrid materials by simultaneous formation of both components	2	6
• Applications	1	3

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	39	**3**	---	---	---	42
	Actual	39	**3**	---	---	---	42
Credit	Planned	3	---	---	---	---	3
	Actual	3	---	---	---	---	3

3. Individualstudy/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	**Knowledge**		
1.1	Recognize the methods of nanoparticles and	• Lectures	• Exams

	hybride materialspreparation	• Scientific discussion • Library visits • Web-based study	• web-based student performance systems
1.2	Name the some applications of nanomaterials and hybride materialsin industry		
2.0	**Cognitive Skills**		
2.1	Compare between properties of nanomaterialsand hybride materials	• Scientific discussion • Library visits • Web-based study	• web-based student performance systems exams
2.2	Compare between methods of characterization of nanomaterialsand hybride materials		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Ability to communicate results of work to classmates.	• Scientific discussion • Library visits • Web-based study	• web-based student performance systems • individual and group presentations
3.2	Ability to work in a team to perform a specific task.		
4.0	**Communication, Information Technology, Numerical**		
4.1	Interpret the results of characterization tools	• Scientific discussion • Library visits	• web-based student performance systems • individual and group presentations
4.2	Encourage students to use internet for searching certain electronic journals regarding topics of the course.		
4.3	Scientific writing.		
5.0	**Psychomotor(if any)**		
5.1	NOT APPLICABLE		
5.2			

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

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)

- Presence of faculty members to provide consulting and advice.

- Office hours: during the working hours weekly, and the creation of appropriate means.

E Learning Resources

1. List Required Textbooks

1. Nanochemistry. G.B. Sergeev, K.J. Klabunde, Elsevier, **2013**, ISBN: 978-0-444-59397-9
2. Introduction to Nanoscience and Nanotechnology, Gabor L. Hornyak, H.F. Tibbals, Joydeep Dutta, John J. Moore, CRC Press. Copyright, **2009**.
3. Nanomaterials and Nanochemistry, C. Bréchignac, P. Houdy, M. Lahmani, Springer Science & Business Media. Copyright, **2006**.
4. "Nanochemistry, A Chemical Approach to Nanomaterials", G. Ozin and A. Arsenault, RSC (Royal Society of Chemistry), **2005**.
5. "Nanostructures and Nanomaterials", G. Cao, Imperial College Press, **2004**
6. Nanotechnology: Nanomaterials and Nanodevices, G. Mohan Kumar, Alpha Science International Ltd. **2015**
7. Synthesis and Tribological Applications of Hybrid Materials, Mohammad Jawaid (Editor), Rajini Nagarajan (Editor), Jacob Sukumaran (Editor), Patrick De Baets (Editor) ISBN: 978-3-527-80859-5 August **2018** 248 Pages
8. Handbook of Organic-Inorganic Hybrid Materials and Nanocomposites, Hari Singh Nalwa (Author), American Scientific Publishers (March 24, **2013**), ISBN-10: 158883011X, ISBN-13: 978-1588830111

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

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

1. Nanochemistry. G.B. Sergeev, K.J. Klabunde, Elsevier, **2013**, ISBN: 978-0-444-59397-9
2. Introduction to Nanoscience and Nanotechnology, Gabor L. Hornyak, H.F. Tibbals, Joydeep Dutta, John J. Moore, CRC Press. Copyright, **2009**.
3. Nanomaterials and Nanochemistry, C. Bréchignac, P. Houdy, M. Lahmani, Springer Science & Business Media. Copyright, **2006**.
4. "Nanochemistry, A Chemical Approach to Nanomaterials", G. Ozin and A. Arsenault, RSC (Royal Society of Chemistry), **2005**.
5. "Nanostructures and Nanomaterials", G. Cao, Imperial College Press, **2004**
6. Nanotechnology: Nanomaterials and Nanodevices, G. Mohan Kumar, Alpha Science International Ltd. **2015**

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

-**http://en.wikipedia.phys/wiki/Petroleum1**

-**http://www.chemhelper.com/**

- **http://www.chemweb.com/**

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.) **-classroom capacity (30) students.**
2. Technology resources (AV, data show, Smart Board, software, etc.) **No other requirements**
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)

G Course Evaluation and Improvement Procedures

1. Strategies for Obtaining Student's Feedback on Effectiveness of Teaching **Scheduled to complete the questionnaire calendar in particular.** **- Focus group discussions with small groups of students.**
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department **Feedback and assistance from colleagues.** **- Independent evaluation of the extent to which students of the standards.** **- independent advice to the duties and tasks**
3. Procedures for Teaching Development **- Workshops for the teaching methods.** **- Continuous training for the faculty member.** **- Revision of the proposed strategies.** **- Application of the means of e-learning.** **- Exchange of internal and external experiences**
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) **Checking the samples of test papers, or student work, which has been corrected by a faculty member.** **- Exchange professors from different educational institutions on regular basis to correct samples of test papers**
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. **Consult with other professors teaches the same subject.** **- Hosting a visiting professor to evaluate the subject.** **- Workshops for teachers whom teach the same subject.** **- Periodic review for teachers to modify the negatives contents in the subject**.

Name of Course Instructor: Prof. Abd El Rahman Khedr

Signature: - **Date Completed: 14/2/2019**

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ **Date Received: 14/2/2019**

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Water Treatments and Purifications**

Course Code: **402850-3**

Date: 14-12-2019	**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: **Water treatments and purifications / 402850-3**
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: **Prof. Amr Lotfy Saber**
5. Level/year at which this course is offered: **3rd / 2nd**
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		percentage?	
b. Blended (traditional and online)	■	percentage?	100%
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

By the end of this course student will be able to:

1- Know different water sources and its ability to renew.
2- Familiar with quality control and environmental pollutions and effect of the pollutants on human health.
3- Able to treat waste water using different methods of purification and tests of significance.

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)

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

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
Requirement of water and sources	1	3
Water quality standards	1	3
Physico chemical parameters and significance-odor-temperature turbidity, density, solids, hardness, acidity and alkalinity	1	3
Dissolved oxygen-organic chemicals, solid substances and secondary drinking water standards	1	3
Determination of pH, CO_2, alkalinity (carbonate, bicarbonate)	1	3
Determination of hydroxide, chloride, fluoride, sulphate, and H_2S.	1	3
Determination of calcium, magnesium, sodium, potassium, iron (total ferrous and ferric), ammonia, nitrite and nitrate	1	3
Determination of phosphorous (total inorganic and organic), phenols, surfactants and pesticides	1	3

Mid term exam	**1**	**3**
Municipal or utility water treatment and on-site treatment	**1**	**3**
A brief idea of sedimentation, coagulation and flocculation	**1**	**3**
Water purification processes, corrosion and its control	**1**	**3**
Different methods for water purificationto remove toxic compounds, refractory organics, dissolved inorganic substances	**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. Individualstudy/learning hours expected for students per week. 3 h

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	Know different water sources, quality control and data handling in analytical chemistry techniques and how to select the optimum samples	• Lectures • Scientific discussion • Library visits • Web-based study	• Exams • web-based student performance systems

1.2	Recognize the industrial pollutions present in water		• portfolios • long and short essays
1.3	Describe analytical chemistry in manufactures and found way for purification and corrosion control		
1.4	Familiar with the separation and purification methods for separate the pollutants		
1.5	Write selective industrial applications		
2.0	**Cognitive Skills**		
2.1	Develope the reverse think skills and predict the suitable methods for industrial pollutants separation from water samples	• Lectures • Scientific discussion • Library visits • Web-based study	• Exams • web-based student performance systems • portfolios • posters demonstrations
2.2	Create the different ideas for water treatment		
2.3	Explain the methods and ways of analytical chemistry – environmental analytical chemistry to remove industrial pollutions		
2.4	Explain the suitable method to determine the organic and inorganic pollutants in different water samples		
2.5	Plan for research program in water purification field		
2.6	Create briefly ideas for sedimentation, coagulation and flocculation Illustrate the suitable methods of water analysis in analytical chemistry and tests of significance Evaluate the optimal parameters to select the best analytical methods and purification procedures		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Develop the student's ability in self-reliance and responsibility.	• Dividing students into groups to carry out collective scientific reports.	• Evaluate the results of collective works and duties as well
3.2	Choose the suitable method to solve problems.		

3.3	Operate in team work and accept his college's opinions.	• Periodic individual duties to develop the skill of taking responsibility and self-reliance.	as knowing the contribution of each individual through dialogue and discussion. • Assessment of individual tasks and duties to determine the student's ability to self-reliance.
4.0	**Communication, Information Technology, Numerical**		
4.1	Enhancing the ability of students to use computers and internet.	• Lectures • Scientific discussion • Library visits • Web-based study	• web-based student performance systems • individual and group presentations
4.2	Interpret chemical data		
4.3	Present chemical data orally.		
4.4	Know how to write a report.		
5.0	**Psychomotor(if any)**		
5.1	NOT APPLICABLE		
5.2			

5. Assessment Task Schedule for Students During the Semester

	Assessment task (i.e., essay, test, quizzes, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Activities and Assignments.	--	10 %
2	Midterm Exam.	8	30 %
3	Final Exam.	15-16	60 %
4	**Total**	**100%**	

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 havefaculty membersto providecounseling andadvice.**
- **Office hours: During the working hoursweekly.**
- **Academic Advisingforstudents.**

E Learning Resources

1. List Required Textbooks

- R. Kellner, J. M. Mermet, M. Otto, M. Valcarcel and H. M. Widmer, *Analytical Chemistry*, 2nd edition, WILEY (2014)

- K. Danzer, *Analytical Chemistry, Theoretical and Metrological Fundamentals*, Springer(2014)
- Industrial water pollution control, 3rd ed, W. Wesley Eckenfelder, Jr., McGraw-Hill, Inc., 2000
- 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)
- DhrubaCharan Dash. *Analytical Chemistry* (2017) PHI Learning Private Limited.

2. List Essential References Materials (Journals, Reports, etc.)
   - Lecture Hand outs available on the coordinator website

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.

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 (30) students.
   - Providing hall of teaching aids including computers and projector.

2. Technology resources (AV, data show, Smart Board, software, etc.)
   - **Room equipped with computer and 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
   - **Complete the questionnaire evaluation of the coursein particular.**

2. Other Strategies for Evaluation of Teaching by the Instructor or the Department
   - Observations and the assistance of colleagues.
   - Independent evaluation forextent toachieve students the standards.
   - Independent advice of the duties and tasks.

3. Procedures for Teaching Development
   - Workshops for teaching methods.
   - Continuous training of member staff.
   - Review of strategies proposed.
   - Providing new tools for learning.
   - The application of e-learning.
   - Exchange of experiences internal andexternal.

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. • Periodic review of the contents ofthe syllabus and modify the negatives. • 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: Prof. Amr Lotfy Saber
Signature: _____ Date Completed: ___14 /2/2019_____
Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ Date Received: 15 /2/2019

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: **Renewable Energy**

Course Code: **402851-3**

Date: 14-12-2019	**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: **Renewable energy / 402851-3**
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. Ahmed Fawzy Saad**
5. Level/year at which this course is offered: **3rd / 2nd**
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		percentage?	
b. Blended (traditional and online)	■	percentage?	100%
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other		percentage?	

Comments:

B Objectives

1. The main objective of this course

- Students know renewable energy resources as alternative sources for finite sources.
- To understand and analyze the present and future energy demand of world and nation regarding the available renewable energy resources.
- Brief introduction on fundamentals of solar energy and photovoltaic cells
- Brief introduction to fuel cells.

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)

- Using information technology and the Internet to prepare detailed research of everything new in the course.
- Add lectures to review all new applications in the area of specialization through use of explanatory films and presentations (Video Projector), (power point)
- Workshops and scientific forums regularly for more information and training.

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
Introduction to renewable energy	1	3
The main sources of energy	1	3
Problems associated with the use of conventional energy sources, including fossil fuels, chemistry of fossil foils, with regard to future supply and the environment.	1	3
Solar energy: An overview including principles of photovoltaics, dye sensitized solar cells and photoelectrochemical cells.	2	6
Solar cells as cost effective alternative - Impact on environment.	1	3
Fuel cells: The working principles of a Fuel Cell.	2	6
Mid. Term Exam.	1	3
Fuel cells types	1	3
Polymer Electrolyte Fuel Cell and Direct Methanol Fuel Cells as examples	2	6

Final exam	**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. 3 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	Know the main sources of energy	• Lectures • Scientific discussion • Library visits • Web-based study	• Exams • web-based student performance systems • portfolios • long and short essays • posters lab manuals
1.2	To define the polymer electrolyte fuel cell and direct methanol fuel cells		
1.3	Write about types of solar cells		
1.4	Mention types of fuel cells		
2.0	**Cognitive Skills**		
2.1	Differentiate between solar cells	• Lectures • Scientific discussion • Library visits • Web-based study	• web-based student performance systems • portfolios • posters
2.2	Compare Fuel cells		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Have the ability for teamwork and the distribution of tasks.	Scientific discussion	web-based student performance systems
4.0	**Communication, Information Technology, Numerical**		
4.1	Able to debate and dialogue with clear scientific	- Lectures	-web-based student

	method.	- Scientific discussion - Library visits - Web-based study	performance systems - individual and group presentations
4.2	Able to present or explain scientific topic.		
5.0	**Psychomotor(if any)** NOT APPLICABLE		

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

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)

E. Learning Resources

1. List Required Textbooks

- Handbook of Solar Energy: Theory, Analysis and Applications**, Authors:** Tiwari**, G,** Tiwari**, Arvind,** Shyam, Springer, 2016
- Fuel cells: problems and solutions, Vladimir S. Bagotsky, Second Edition, John Wiley & Sons, 2012.

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

- Applied Photovoltaics, Stuart Wenham, Martin Green, and Muriel Watt, Earthscan, 2007, ISBN 1- 84407-407-3

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

- http://www.chemweb.com
- http://www.sciencedirect.com

4. Other learning material such as computer-based programs/CD, professional standards or regulations and software.
None.

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 (30) students. • Providinghall of teaching aids including computers and projector.
2. Technology resources (AV, data show, Smart Board, software, etc.) **Room equipped with computer and projector.**
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 • Questionnaires can be used to collect student feedback. • Student representation on staff-student committees and institutional bodies.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • Observations and the assistance of colleagues. • Independent evaluation for extent to achieve students the standards. • Iindependent advice of the duties and tasks.
3. Procedures for Teaching Development ▪ Workshops for teaching methods. ▪ Continuous training of staff members. ▪ Review of strategies proposed. ▪ The application of e-learning.
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. • Periodic Review of the contents of the syllabus and modify the negatives. • Consult other staff of the course. • Workshops for teachers of the course.

Name of Course Instructor: Dr. Ahmed Fawzy Saad
Signature: _____ Date Completed: ___14 /2/2019_____
Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ Date Received: 15 /2/2019

4/1/4. Course Specification:

COURSE SPECIFICATIONS

Form

Course Title: Nuclear Chemistry

Course Code: 402852-3

Date: 16-2-2019	**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: **Nuclear Chemistry / 402852-3**
2. Credit hours: **3 (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: **Prof. Abdalla Mohamed Khedr**
5. Level/year at which this course is offered: **3rd / 2nd**
6. Pre-requisites for this course (if any): **None**
7. Co-requisites for this course (if any): **None**
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		percentage?	
b. Blended (traditional and online)	■	percentage?	80%
c. E-learning		percentage?	
d. Correspondence		percentage?	
f. Other	■	percentage?	20%

Comments:

B Objectives

1. The main objective of this course

The main purpose of this course is to familiarize students with:

a. The importance of nuclear chemistry.
b. The differences between normal chemical reactions and nuclear reactions.
c. Detection of radioactivity and classification of nuclides.
d. Types of radioactive decay and penetrating power of radiation.
e. Structure and stability of the nucleus (nuclear stability) and radioactive series.
f. Nuclear transmutations, nuclear binding energies and rates of radioactive decay.
g. Nuclear dating and artificially induced radioactivity.
h. Nuclear fission, nuclear fuels and nuclear reactors.
i. Nuclear fusion, plasma and plasma confinements.
j. Hydrogen bomb and important applications of radioisotopes.

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)

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

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
• General introduction about nuclear chemistry and its importance.	1	3
• Radiation, radioactivity and nuclear reactions - Detection of radioactivity - Nucleons, nuclides and classification.	2	6
• Types of radioactive decay - Penetrating power of radiation	1	3

• Structure and stability of the nucleus (nuclear stability) and radioactive series.	**1**	**3**
• Nuclear transmutations - Nuclear binding energies - Rates of radioactive decay.	**1**	**3**
• Nuclear dating and artificially induced radioactivity.	**1**	**3**
• Nuclear fission and nuclear fuels.	**2**	**6**
• Nuclear reactors.	**1**	**3**
• Nuclear fusion - Plasma - Plasma confinements.	**2**	**6**
• Hydrogen bomb - Important applications of radioisotopes.	**2**	**6**

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

		Lecture	Tutorial	Laboratory/ Studio	Practical	Other	Total
Contact Hours	Planned	42	---	---	---	---	42
	Actual	42	---	---	---	---	42
Credit	Planned	3	---	---	---	---	3
	Actual	3	---	---	---	---	3

3. Individualstudy/learning hours expected for students per week. **3**

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	Know the different types of radioactive decay.	• Lectures	• Written mid-term

1.2	Write on the importance of nuclear chemistry and its applications.	• Scientific discussion • Use the library to work duties and a small research on bioinorganic chemistry. • Use of the internet to carry out some reports on course subjects.	and final exams. • Long and short essays.
1.3	Recall the nuclear transmutations, nuclear binding energies and rates of radioactive decay.		
1.4	Describe the nuclear fission, nuclear fusion and types of nuclear reactors.		
1.5	Discuss the basic of hydrogen bomb and penetrating power of radiation.		
2.0	**Cognitive Skills**		
2.1	Compare between chemical nuclear reactions and normal chemical.	• Lectures • Scientific discussion • Library visits • Web-based study	• Mid-term and final exams. Measuring the response to the assignments.
2.2	Estimate the methods of plasma confinements.		
2.3	Summarize the important applications of radioisotopes.		
2.4	Analyze the relation between structure and stability of the nucleus (nuclear stability).		
3.0	**Interpersonal Skills & Responsibility**		
3.1	Develop the student's ability in self-reliance and responsibility.	• Dividing students into groups to carry out collective scientific reports. • Periodic individual duties to develop the skill of taking responsibility and self-reliance.	• Evaluate the results of collective works and duties as well as knowing the contribution of each individual through dialogue and discussion. • Assessment of individual tasks and duties to determine the student's ability to self-reliance.
3.2	Choose the suitable method to solve problems.		
3.3	Operate in team work and accept his college's opinions.		
4.0	**Communication, Information Technology, Numerical**		

4.1	Perform mathematical calculations and data analysis.	• Visiting research centers. • The use of computers in the training room of the department. • Using the internet for collecting data.	• Evaluation of the duties associated with the proper use of numerical and communication skills. • Web-based student performance systems. • Individual and group presentations.
4.2	Use computers and the international information network (the Internet) to perform calculations and to identify recent research relevant to decision sources.		
5.0	**Psychomotor(if any)**		
5.1 5.2	Not applicable.		

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

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 hoursweekly.
- Academic advising for students.
- Availability of Staff members to provide counselling and advice.

E Learning Resources

1. List Required Textbooks

- Walter D. Loveland , David J. Morrissey and Glenn T. Seaborg "*Modern Nuclear Chemistry*", New York, John Wiley & Sons Inc. (2006).
- David J. Morrissey, Walter D. Loveland and Glenn T. Seaborg "Introductory Nuclear Chemistry" New York, John Wiley & Sons Inc. (2001).

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

- Journal of Nuclear Materials.

• Journal of Nuclear Energy.
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. • No other requirements.

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.) • Smart classes are needed equipped with Internet access (scheduled for 3 hours once a week).
2. Technology resources (AV, data show, Smart Board, software, etc.) • Room equipped with computers, data show andTV.
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 • Confidential completion of standard course evaluation questionnaire. • Focused group discussion with small groups of students.
2. Other Strategies for Evaluation of Teaching by the Instructor or the Department • 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. • Visits by other faculty can provide information about the process of teaching. • Colleagues have the expertise to evaluate the quality of a course as evidenced by its content and format (peer reviewers). • 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.
3. Procedures for Teaching Development • Training programs and workshops for Staff member. • Review of strategies proposed. • The application of e-learning. • Providing new tools for 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 by an independent member teaching staff of a sample of student work. • Periodic exchange and remarking of tests or a sample of assignments with staff at another

institution.
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for developing it. • Workshops for teachers of the course. • Periodic review of the contents of the syllabus and modify the negatives. • Consult other staff of the course. • Hosting a visiting staff to evaluate of the course.

Name of Course Instructor: Prof. Abdalla Mohamed Khedr

Signature: - **Date Completed: 16/2/2019**

Program Coordinator: Dr. Ismail Ibrahim Althagafi

Signature: _____ **Date Received: 16/2/2019**

جامعة أم القرى

كلية العلوم التطبيقية

الماجستير في الكيمياء