



**ATTACHMENT 2 (e)**

**Course Specifications**

**Kingdom of Saudi Arabia**

**The National Commission for Academic Accreditation & Assessment**

# **Solid State Chemistry**

**4024582-2**

## **Course Specifications (CS)**





### Course Specifications

Institution: Umm Al-Qura University	Date of Report: 2017
College/Department : Faculty of Applied Science / Department of Chemistry	

#### A. Course Identification and General Information

1. Course title and code: Solid State Chemistry / 4024582-2		
2. Credit hours: <b>2 theoretical</b>		
3. Program(s) in which the course is offered. <b>Chemistry</b> (If general elective available in many programs indicate this rather than list programs)		
4. Name of faculty member responsible for the course: <b>Prof. Nashwa Mahmoud El-Metwaly</b>		
5. Level/year at which this course is offered: seventh/fourth		
6. Pre-requisites for this course (if any): Coordination Chemistry		
7. Co-requisites for this course (if any): Nothing		
8. Location if not on main campus: <b>both on El-Abedyah and El-Zaher</b>		
9. Mode of Instruction (mark all that apply)		
a. Traditional classroom	<input checked="" type="checkbox"/>	What percentage? 100%
b. Blended (traditional and online)		What percentage? <input type="text"/>
c. e-learning		What percentage? <input type="text"/>
d. Correspondence	<input type="text"/>	What percentage? <input type="text"/>
f. Other	<input type="text"/>	What percentage? <input type="text"/>
Comments:		

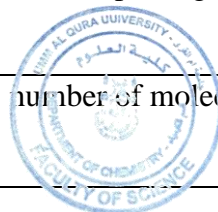


## B. Objectives

<p>1. What is the main purpose for this course?</p> <p>The main purpose for this course is to study:</p> <ol style="list-style-type: none"> <li>The bases of solid state chemistry.</li> <li>Crystallography and their kinds.</li> <li>The effect of X-ray on different crystals</li> <li>The crystallographic shapes and semiconductors.</li> </ol>
<p>2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)</p> <ul style="list-style-type: none"> <li>Diversify the sources of the course topics for benefit from more than one source.</li> <li>Compared the topics of what is served in other local, regional and global sections.</li> </ul>

## C. Course Description (Note: General description in the form to be used for the Bulletin or handbook should be attached)

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact Hours
Introduction to solid state chemistry	1	2
Study the crystal structures properties, crystal lattice, type of crystals (covalent - ionic)- cubic centered face- cubic centered body.	1	2
Learn Bravais lattices	1	2
Study the symmetry operators , elements and axis of rotation, symmetry and point group of molecules and point group of unit cells-point groups and space groups	2	4
Calculate the volume of the unit cell , atomic radius , number of molecules , close and square packing and the density.	1	2





X- ray diffractions and Bragg's law	1	2
Crystal structure of solids: Solid crystallography- X-Ray crystallography (interference phenomenon and diffraction method)	2	4
X-ray diffraction in the crystal structure - X-ray absorption- X-Ray spectrum - experimental crystal study (Lewis method - Rotatable crystal-powder diffraction)	1	2
How to calculate Miller indices of directions and planes-calculate inter-planar d -spacing (dhkl)	1	2
The crystal binding in solid Material, lattice energy and ionic charge.	1	2
How to detect the crystal defects and types of defects.	1	2
Effect of impurities on the properties of semiconductors (n-type and p-type semiconductor).	1	2

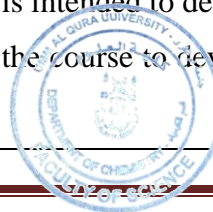
2. Course components (total contact hours and credits per semester):

	Lecture	Tutorial	Laboratory	Practical	Other:	Total
Contact Hours	28	4	0	0	0	32
Credit	2	0	0	0	0	2

3. Additional private study/learning hours expected for students per week.  
- 2 hours per week for homework's on e-learning website.

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy:

- A brief summary of the knowledge or skill the course is intended to develop;
- A description of the teaching strategies to be used in the course to develop that knowledge or skill;





- The methods of assessment to be used in the course to evaluate learning outcomes in the domain concerned.

	<b>NQF Learning Domains And Course Learning Outcomes</b>	<b>Course Teaching Strategies</b>	<b>Course Assessment Methods</b>
<b>1.0</b>	<b>Knowledge</b>		
1.1	Understand the concepts of basic principles structures of solid state.	-Lectures. - Dialogue and discussion -Video shows - Assignment on e-learning cite of the University	Two midterm and final exams that consist of the following types of knowledge questions (40% of final assessment): 10 % assessment for Quizzes, open discussion as groups and homework at e-learning 50% the final exam
1.2	Recall the crystal systems and their properties and how different between polymorphism and isomorphism.		
1.3	Know how to calculate Miller Indices of directions and plans		
1.4	Recall the crystal defects, types of defects (point, line, surface) and how to calculate the concentrations of the defects according to types of defects.		
1.5	Define X-ray diffraction in the crystal structure X-ray absorption- X-Ray spectrum - experimental crystal study (Lewis method - Rotatable crystal- powder diffraction)		
<b>2.0</b>	<b>Cognitive Skills</b>		
2.1	Calculate the concentrations of the defects according to types of defects.	- lecture using smart classes - Dialogue and discussion. - Posting many examples and questions on the web page as homework .	-Two midterm and final exams that consist of the following types of cognitive skills
2.2	Calculate Miller Indices at different directions and plans		



2.3	Define the crystal system and their properties such as no of molecules , coordination numbers for the different cubic systems	<ul style="list-style-type: none"> <li>- Offering the available references in the library and websites specialized in this field for the students.</li> <li>- Demonstrating the different shapes for cubic systems , conduction in metals using videos</li> <li>- Offering the different Models for Bravais lattices and lattice types</li> </ul>	<p>questions (40% of mid assessment):</p> <ul style="list-style-type: none"> <li>- (5 % of final assessment ) :</li> </ul> <p>Homework assignments .</p> <ul style="list-style-type: none"> <li>- (5 % of final assessment ) : Quizzes</li> </ul> <p>Final exam (50%)</p>
<b>3.0</b>	<b>Interpersonal Skills &amp; Responsibility</b>		
3.1	Educating student about ethics of dealing with his colleagues and with the instructors and supervisor	<ul style="list-style-type: none"> <li>-Distribution students to different groups to acquire skills of dealing with everyone.</li> <li>- Discussion in groups</li> <li>- Written reports about one of topic related of the course</li> </ul>	<ul style="list-style-type: none"> <li>-Assessment of assignments includes portion of grade for effectiveness of investigation processes.</li> <li>- Personal performance in classroom.</li> </ul>
3.2	Teaching students the responsibility toward themselves and toward others.		
3.3	Working in group to make the students aware of responsibility		
3.4	Instilling the self-learning character in the student		
3.5	Decision-making (independence)		
<b>4.0</b>	<b>Communication, Information Technology, Numerical</b>		
4.1	The ability to communicate with his colleagues	<ul style="list-style-type: none"> <li>-Applying the effective tools for Student assignments.</li> <li>- Teaching by using the e-learning tools.</li> </ul>	<ul style="list-style-type: none"> <li>-Assignments of home works in the e-learning website as well as solve problems</li> </ul>
4.2	Enhancing the knowledge in information technology that will enable them to gather,		



	interpret, and communicate information and ideas	- Given 5 min at the end of each lecture to selected one of students to re-mentioned again the main topics introduced in lecture	in the different exams
4.3	Providing 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	The use of search engines across the Web		
<b>5.0</b>	<b>Psychomotor</b>		
	No applicable		

#### 5. Schedule of Assessment Tasks for Students During the Semester

	Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.)	Week Due	Proportion of Total Assessment
1	Homework or activities.	--	10 %
2	First Periodic Exam.	6	20 %
3	Second Periodic Exam.	12	20 %
4	Final Exam. (2 hours exam)	16	50 %
5	<b>Total</b>		<b>100 %</b>

#### D. Student Academic Counseling and Support

1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)

-Office Hours: 5 hours

Total 5 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



Lesley E. Smart, Elaine A. Moore, Solid State Chemistry: An Introduction, 4<sup>th</sup>, CRC press (Taylor & Frances) 2012

- Lesley E.Smart , Elaine A.Moore , Solid State Chemistry ; An Introduction, 3<sup>rd</sup>, Taylor & Francis Group, 2005 LLC

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

Lesley E. Smart, Elaine A. Moore, Solid State Chemistry: An Introduction, 4<sup>th</sup>, CRC press (Taylor & Frances) 2012

- Lesley E.Smart , Elaine A.Moore , Solid State Chemistry ; An Introduction, 3<sup>rd</sup>, Taylor & Francis Group, 2005 LLC

3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)

Lesley E. Smart, Elaine A. Moore, Solid State Chemistry: An Introduction, 4<sup>th</sup>, CRC press (Taylor & Frances) 2012

- Lesley E.Smart , Elaine A.Moore , Solid State Chemistry ; An Introduction, 3<sup>rd</sup>, Taylor & Francis Group, 2005 LLC

4. List Electronic Materials (eg. Web Sites, Social Media, etc.)

<http://www.mx.iucr.org/iucr-top/comm/cteach/pamphlets/13/node5.html>

<http://img.chem.ucl.ac.uk/sgp/mainmenu.htm>

[www.shef.ac.uk/.../solid-state-chemistry-applications-msc](http://www.shef.ac.uk/.../solid-state-chemistry-applications-msc)

[www.simplybooks.in/solid-state-chemistry-its-anthony-r-book..](http://www.simplybooks.in/solid-state-chemistry-its-anthony-r-book..)

[www.infibeam.com/.../solid-state-chemistry-its-applications/9...](http://www.infibeam.com/.../solid-state-chemistry-its-applications/9...)

<http://www.seas.upenn.edu/~chem101/sschem/solidstatechem.html>

<http://www.webqc.org/symmetry.php>

[http://en.wikipedia.org/wiki/Molecular\\_geometry](http://en.wikipedia.org/wiki/Molecular_geometry)

[http://en.wikipedia.org/wiki/Molecular\\_graphics](http://en.wikipedia.org/wiki/Molecular_graphics)

[http://butane.chem.uiuc.edu/cyerkes/Chem102AEFa07/Lecture\\_Notes\\_102/newL102.htm-ecture%2014](http://butane.chem.uiuc.edu/cyerkes/Chem102AEFa07/Lecture_Notes_102/newL102.htm-ecture%2014)

[http://www.wyzant.com/Help/Science/Chemistry/Lewis\\_Structures\\_VSEPR](http://www.wyzant.com/Help/Science/Chemistry/Lewis_Structures_VSEPR)

<http://www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro3.htm>

[www.drills.com/VSEPR.php-.chemistry](http://www.drills.com/VSEPR.php-.chemistry)

<http://cat.middlebury.edu/~chem/chemistry/class/general/ch103/chapter9/Test.html>

<http://kiel.de/herges/modeling/gliederung.html>-<http://scholle.oc.uni>

<http://faculty.ucsd.edu/trogler/GroupTheory224/Grouptheory.html>-<http://chem>





<http://www.seas.upenn.edu/~chem101/sschem/solidstatechem.html>  
<http://phycomp.technion.ac.il/~ira/types.html> [http://en.wikipedia.org/wiki/Solid-state\\_chemistry](http://en.wikipedia.org/wiki/Solid-state_chemistry)  
[www.shef.ac.uk/.../solid-state-chemistry-applications-msc](http://www.shef.ac.uk/.../solid-state-chemistry-applications-msc)  
[www.simplybooks.in/solid-state-chemistry-its-anthony-r-book..](http://www.simplybooks.in/solid-state-chemistry-its-anthony-r-book..)  
[www.infibeam.com/.../solid-state-chemistry-its-applications/9...](http://www.infibeam.com/.../solid-state-chemistry-its-applications/9...) [http://books.google.com.sa/books?id=-EKcm5UQaqEC&hl=ar&redir\\_esc=y](http://books.google.com.sa/books?id=-EKcm5UQaqEC&hl=ar&redir_esc=y)

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

- Isisdraw and Chemdraw and Chemoffice

-MS-Office 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.)

- A classroom containing at least 45 seats and equipped with projector and Internet access (scheduled for 2 hours once a week).

2. Computing 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)

- Isisdraw and Chemdraw and Chemoffice

## G. Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student 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 Program/Department Instructor

- Observations and assistance from colleagues.

3 Processes for Improvement of Teaching

- Workshops on teaching methods.
- Review of recommended teaching strategies.
- Periodical department revisions by using specialists.

4. Processes for Verifying Standards of Student Achievement (e.g. 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)

- 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 improvement.

- 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.
- Perform the necessary changes based on the feedback from the statistical analysis of the student grades.
- Perform the necessary changes based on the feedback from the workshops, conferences, and seminars recommendations.
- Perform the necessary changes based on the feedback from the experts in the field and faculty members.

**Faculty or Teaching Staff: Prof. Nashwa Mahmoud El-Metwaly**

**Signature:**

**Date Report Completed: 12/1/2019**

**Received by: Dr. Ismail Althagafi**

**Department Head**

**Signature:**

**Date: 20/1/2019**

