جامعة الإسراء
ISRA UNIVERSITY

Course Syllabus

According to JORDAN National Qualification Framework (JNQF)

Course Name: Inorganic Chemistry 1

Course Number: 11012121

General Course Information:

Course title	**Inorganic Chemistry 1**
Course number	**11012121**
Credit hours	**3**
Education type	**Face-to-Face**
Prerequisites/corequisites	**General Chemistry 2**
Academic Program	**Chemistry**
Program code	**01**
Faculty	**Science**
Department	**Chemistry**
Level of course	**Second year**
Academic year /semester	**2022/2023- First semester**
Awarded qualification	**Bachelor**
Other department(s) involved in teaching the course	**None**
Language of instruction	**English**
Date of production/revision	**16/10/2022**

Course Coordinator:

Coordinator's name	**Dr. Manal Alkhabbas**
Office No	**4231**
Office Phone extension number	**2510**
Office Hours	**11-12 Sun, Tue and Thu, 10-12 Mon and Wed.**
Email	**manal.khabbas@iu.edu.jo**

Other Instructors:

Instructor name	
Office No	
Office Phone extension number	
Office Hours	
Email	

Course Description *(English/Arabic)*:

English	Atomic structure; molecular structure and bonding; ionic bonding: lattice energy; packing and ionic sizes; Born-Haber cycle and applications; aqueous solution; acids and bases and non-aqueous solvents.
Arabic	التركيب الذري, الترابط بين الجزيئات وأشكالها، الرابطة الأيونية, طاقة الشبكة البلورية, التراص وأحجام الأيونات, حلقة بورن هابر وتطبيقاتها، المحاليل المائية، الأحماض والقواعد والمحاليل اللامائية

Textbook: *Author(s), Title, Publisher, Edition, Year, Book website.*

Catherine E. Housecroft and Alan G Sharpe, Inorganic Chemistry, Pearson Prentice Hall, 4th Edition, 2012, https://www.amazon.com/Inorganic-Chemistry-4th-Catherine-Housecroft/dp/0273742752.

References: ***Author(s), Title, Publisher, Edition, Year, Book website.***

Shriver, M. Weller, T. Overton, J. Rourke, F. Armstrong, Inorganic Chemistry, Macmillan Education (W. H. Freeman), 6th edition, 2014, https://www.amazon.com/Inorganic-Chemistry-Duward-Shriver/dp/1429299061.

Course Educational Objectives (CEOs):

	Upon completion of the course, students will be able to:
1.	**understand the basic nuclear and electronic structure of atoms.**
2.	**become familiar with the periodic table and how the atomic properties of the elements are related to their position on the periodic table.**
3.	**understand the theoretical basis of structure and bonding of molecule.**
4.	**solve problems related to the course.**
5.	**describe the common structures of crystals**
6.	**understand solvent systems and acid-base behavior**

Intended Learning Outcomes (ILO's):

	Subject Intended learning outcomes (ILOs) describe what students are expected to know and be able to do at the end of the course. These outcomes are related to the knowledge, skill and competence that students acquire:	Relationship to CEOs	Contribution to PLOs	Bloom Taxonomy Levels*	Descriptors**
A	**Knowledge and Understanding:**				
A1	**Describe the atomic structures and periodic properties of atoms and ions.**	**1, 2**	**b**	**Knowledge**	**K**
B	**Intellectual skills:**				
B1	**Calculate energy states and transition energies of hydrogen atom according to the Bohr atom, effective nuclear charge, and diploe moment.**	**4**	**d**	**Application**	**S**
B2	**Explain the structure and bonding of molecules by using Valence Bond Theory and Molecular Orbital Theory.**	**3**	**a**	**Comprehension**	**S**
B3	**Explain crystal structures of metallic and ionic solids.**	**5**	**a**	**Comprehension**	**S**
B4	**Determine lattice energy and predict Born Haber cycle of ionic compounds.**	**4**	**c, d**	**Analysis**	**S**
B5	**Explain the behavior of acids, bases and ions in aqueous and non-aqueous solutions.**	**6**	**a**	**Analysis**	**S**

C	**Subject specific skills:**				
C1					
C2					
C3					
D	**Transferable skills:**				
D1					
D2					
D3					

***Bloom Taxonomy Levels**

Level #	1	2	3	4	5	6
Level Name	Knowledge	Comprehension	Application	Analysis	Evaluation	Synthesis

**** Descriptor (National Qualification Framework Descriptors): K : Knowledge, S: Skill, C: Competency.**

Program Learning Outcome (PLOs):

Program Learning Outcomes describe what students are expected to know and be able to do by the time of graduation. These relate to the knowledge, skills, and behaviours that students acquire as they progress through the program. A graduate of the (_____) program will demonstrate:	Descriptors**		
	K	S	C

1.	Describe the fundamental scientific principles and theories across the four subfields of chemistry (Organic, inorganic, analytical and physical).	**x**	**x**	
2.	Identify and confirm chemical compounds structures as well as determine chemical composition.		**x**	
3.	Establish and concludes mechanisms of physical and chemical processes in addition to the ability of mastering qualitative and quantitative determination.		**x**	
4.	Solve the scientific problems using different mechanisms and procedures based on critical thinking.		**x**	
5.	Conduct scientific experiments in chemistry.			**x**
6.	Commitment and interest in lifelong learning, and collaborate effectively with other people in a team.			**x**
7.	Prepare logical, organized and concise written reports, and oral and poster presentations that effectively communicate chemical content to other scientists.	**x**	**x**	**x**
8.	Commitment to the ethical principles of chemical research.		**x**	
9.	Find information about chemistry through databases and information		**x**	
10.	Evaluation of calculations in chemistry experiments and information analysis using computer software.		**x**	
11.	Demonstrate safety laboratory techniques.		**x**	**x**

**** Descriptors according to the national qualifications framework (K: knowledge, S: skill, C: Competency)**

Weekly Schedule *(please choose the type of teaching)*

- ✓ **Face to Face**

□ **Hybrid** *(**2 Lectures** Face – To - Face **+1 Lecture** Asynchronous)*

□ **Hybrid (***1 **Lectures** Face – To - Face **+1 Lecture** Asynchronous)*

□ **Online** *(**2 Lectures** Synchronous **+1 lecture Asynchronous**)*

Week	First Lecture (Face to Face)	Second Lecture (Face to Face)	Third Lecture (Face to Face)	Ach. ILOs	Ach. PLOs	Descriptors**
1	Introduction to course and review of the syllabus	**Basic concepts: atoms Fundamental particles of an atom**	Atomic number, mass number and isotopes	1	b	K
2	Some important successes of classical quantum theory	**An introduction to wave mechanics The wave-nature of electrons**	Particle in a box The Schrödinger wave equation (Introduction)	1, 2	b, d	K
3	Atomic orbitals The quantum numbers	**Many-electron atoms**	Penetration and shielding	1, 2	b, d	K, S

4	The periodic table	**Ionization energies and electron affinities**	**Basic concepts: molecules** Homonuclear diatomic molecules: Valence bond (VB) theory	1, 2, 3	a, b, d	K, S
5	Homonuclear diatomic molecules: molecular orbital (MO) theory	**The octet rule and isoelectronic species**	**Electronegativity**	2, 3	a, d	K, S
6	Dipole moments	MO theory: heteronuclear diatomic molecules	Molecular Shapes and VSEPR Model	2, 3	a, d	K, S
7	Molecular Shapes and VSEPR Model	**Molecular shape: stereoisomerism**	Homework 1 Discussion	3	a	K, S
8	**Bonding in polyatomic molecules:** Valence bond theory: hybridization of atomic orbitals	**1. Valence bond theory: hybridization of atomic orbitals**	Valence bond theory: multiple bonding in polyatomic molecules	3	a	K, S
9	Molecular orbital theory: the ligand group orbital approach and application to triatomic molecules	**Homework 2 Discussion**	Midterm Exam	3	a	K, S
10	**Structures and energetics of ionic solids** Crystal Structures	Packing of Spheres The packing-of-spheres model applied to the structures of elements	Polymorphism in metals Metallic radii Sizes of ions	4	a	K, S
11	Ionic lattices The rock salt (NaCl) structure type CsCl structure	**The fluorite (CaF2) structure type The antifluorite structure type The zinc blende (ZnS) structure type The rutile (TiO_2) structure type**	Lattice energy: estimates from an electrostatic model	4, 5	a, c, d	K, S
12	Lattice energy: The Born-Haber cycle	**Applications of lattice energies**	Defects in solid state lattices	4, 5	a, c, d	K, S

13	**Acids and bases in aqueous solution** Properties of water	Some Brønsted acids and bases	The energetics of acid dissociation in aqueous solution	6	a	K, S
14	Trends within a series of oxoacids Aquated cations: formation and acidic properties	Amphoteric oxides and hydroxides	Solubilities of ionic salts Common-ion effect Hard and Soft acids and bases	6	a	K, S
15	**Non-aqueous media** Relative permittivity	**Acid–base behavior in non-aqueous solvents**	Liquid ammonia Sulfuric acid	6	a	K, S

* **K: Knowledge, S: Skills, C: Competency**

Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:

- **Discussion**
- **Quizzes**
- **Other Interactive online activities**
- **Reports**

Course Policies:

A- Attendance policies:

The maximum allowed absences is 15% of the lectures.

B- Absences from exams and handing in assignments on time:

Midterm exam can be retaken based on approval of excuse by the instructor's discretion.

Not handing assignment on time will incur penalties.

C- Academic Health and safety procedures

D- Honesty policy regarding cheating, plagiarism, and misbehaviour:

Cheating, plagiarism, misbehaviour will result in zero grade and further disciplinary actions may be taken.

E- Grading policy:

- All homework is to be posted online through the e-learning system.
- Exams will be marked within 72 hours and the marked exam papers will be handed to the students.
- Online Activities (Course Videos, Practice labs, Discussion Forums, Quizzes) **20%**
- Midterm **30%**
- Final Exam **50%**

F- Available university services that support achievement in the course: **E-Learning Platform, Labs, Library.**

Required equipment:

- **PC / Laptop with webcam and mic**
- **Internet Connection**
- **Access to the IU E-Learning Platform at: https://elearn.iu.edu.jo/**

- **E-learning plan**
- Satisfaction questionnaires for online and face-to-face learning
- Software for e-learning
- Training

Assessment Tools implemented in the course:

- ✓ Final Exam
- ✓ Midterm Exam
- ✓ Quizzes
- ✓ Homework

Responsible Persons and their Signatures:

Course Coordinator	**Manal Alkhabbas**	**Completed Date**	**16/10/2022**
		Signature	

Received by (Department Head)	**Manal Alkhabbas**	**Received Date**	**16/10/2022**
		Signature