جامعة الإسراء
ISRA UNIVERSITY

Course Syllabus

According to JORDAN National Qualification Framework (JNQF)

Course Name: Inorganic Chemistry 2

Course Number: 11012222

General Course Information:

Course title	**Inorganic Chemistry 2**
Course number	**11012222**
Credit hours	**3**
Education type	**Face-to-Face**
Prerequisites/corequisites	**Inorganic Chemistry 1 (11012121)**
Academic Program	**Chemistry**
Program code	**01**
Faculty	**Science**
Department	**Chemistry**
Level of course	**Second year**
Academic year /semester	**2021/2022- Second semester**
Awarded qualification	**Bachelor**
Other department(s) involved in teaching the course	**None**
Language of instruction	**English**
Date of production/revision	**6/3/2022**

Course Coordinator:

Coordinator's name	**Dr. Manal Alkhabbas**
Office No	**4231**
Office Phone extension number	**2510**
Office Hours	**11-12 Sun, Tue, and Thu, 11-12:30 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	**Introduction to symmetry and group theory. Principles of coordination chemistry: Nature of ligands; Nomenclature; Coordination numbers; Isomerism. Theories of bonding in coordination compounds. Magnetic and spectroscopic properties of coordination compounds. Reaction mechanisms of d-metal complexes.**
Arabic	**مقدمة في التماثل ونظرية المجموعات، أساسيات الكيمياء التناسقية: طبيعة الليجاندات، التسمية, الأرقام التناسقية، التناظر. نظريات الترابط للمركبات التناسقية. الخصائص المغناطيسية والمطيافية للمركبات التناسقية، ميكانيكيات التفاعلات للمركبات المعقدة**

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):

	By the end of this course, the student should be fully aware of:
1.	**Understand the concepts and basic principles of coordination chemistry**
2.	**develop an understanding of bonding theories (VBT, CFT, and MOT)**
3.	**Interpret magnetic properties, and electronic spectra of transition metal complexes**
4.	**Acquire a symmetry-based approach to understanding modern bonding models and spectroscopic properties**
5.	**Understands some common reactions classes of coordination compounds.**

Intended Learning Outcomes (ILO's):

1.	**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 structure and stereochemistry of transition metal complexes.**	**1**	**2**	**2**	**K**
2. B	**Intellectual skills:**				
B1	**Recognize symmetry elements in a molecule and state the point group a molecule belongs to.**	**4**	**4**	**2**	**S**
B2	**Predict the structure and properties based on different theories**	**2**	**4**	**2**	**S**
B3	**Interpret spectra and color of coordination compounds.**	**3**	**4**	**4**	**S**
B4	**Solve different problems related to magnetic moments and CFSE of transition metal complexes.**	**3**	**4**	**3**	**S**
B5	**Differentiate between the types of reactions in coordination complexes and distinguish between their mechanisms**	**5**	**3**	**4**	**C**
3. C	**Subject specific skills:**				
4. C1					

5. D	**Transferable skills:**				
6. D1					

***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**		
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**	
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**	

**** 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	Syllabus and Introduction	Revision of VSEPR Model	Revision of VSEPR Model	1	2	K
2	Topic 1: An Introduction to Molecular Symmetry:	Symmetry Elements	Point Group	2	4	S

	Symmetry Operations					
3	Point Group	Applications of Symmetry	Character tables: an introduction	2	4	S
4	Topic 2: d-Block metal chemistry Ground state electronic configurations d-Block metals	Physical properties of d-Block metals	Introduction Transition metal complexes	1	2	K
5	Coordination numbers Isomerism in d-block metal complexes	Isomerism in d-block metal complexes	Nomenclature of Coordination Compounds	1	2	K
6	Topic 3: Theories of bonding in coordination compounds VBT	Valence Bond Theory	Crystal Field Theory	3	2	K
7	Spectrochemical Series	Low Spin & High Spin Complexes	Crystal field stabilization Energy	4	4	S
8	Jahn–Teller Distortions Crystal Field Splitting with a Tetrahedral Geometry	The square planar crystal field Crystal field theory: uses and limitations	Midterm Exam	3	2	K
9	Molecular Orbital Theory of Octahedral Complexes	Molecular Orbital Theory of Octahedral Complexes	18-electron rule	3	2	K
10	Topic 4: Magnetic and electronic spectra of coordination compounds	d-d electronic transitions Charge transfer spectra	Describing electrons in multi-electron Systems Microstates and term symbols	4	4	S
11	Selection rules Electronic spectra of octahedral and tetrahedral complexes	Electronic spectra of octahedral and tetrahedral complexes	Orgel diagram	4	4	S
12	Tanabe-Sugano Diagrams	Examples on solving electronic spectra	Evidence for metal--ligand covalent bonding: The nephelauxetic effect	4	4	S
13	Magnetic properties	Topic 5: Thermodynamic aspects: ligand Field stabilization	Thermodynamic aspects: ligand Field stabilization	5	4	S
14	Topic 6: Complexation reactions Stability constants of coordination complexes	Stability constants of coordination complexes Chelate effect	d-Block Metal Complexes: Reaction Mechanisms Labile vs. Inert	6	3	C
15	Types of Substitution Mechanism Trans effect	Oxidation-Reduction Reactions	Discussion	6	3	C

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

Teaching Methods and Assignments:

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

- **Assignments**

- **Quizzes**
- **Models**

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:

- **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**	**6/3/2022**
		Signature	

Received by (Department Head)	**Manal Alkhabbas**	**Received Date**	**6/3/2022**
		Signature