



University of Petra		
Faculty of Arts and Sciences		كلية الآداب والعلوم
Department of Chemistry	جامعة البتراء	قسم الكيمياء

### Course Syllabus

Year : 2019/2020

Semester : 2<sup>nd</sup>

Course No.	Course Title	Prerequisite	Co-requisite	Credit Hours Lectures / ECTS: European Credit Transfer System
101331	Inorganic Chemistry (III)	101232		3/5

Instructor Name	e-mail	Office No.	Office ext.	Office Hours
Dr. Hani . A.Y. Mohammad	hmohammad@uop.edu.jo	7213	7213	Tue.,Thu., 10:00-12:00 Mon. 10-11.

Coordinator's Name: (if applicable)

Course Description	
	<ul style="list-style-type: none"> <li>▪ Main – Group Organometallic Compounds ; Chap.15</li> <li>▪ d- and f – Block Organometallic Compounds; ; Chap.16</li> <li>▪ Catalysis ; Chap.17</li> <li>▪ superconductors Net</li> </ul>

#### Course Objectives:

- To instill in students a sense of enthusiasm *حماسة* for organometallic chemistry, an appreciation of its applications in different fields and to involve them in an intellectually stimulating and satisfying experience of learning and studying.
- To develop in students the ability to apply their chemical knowledge and skills to the solution of theoretical and practical problems in organometallic chemistry.
- To generate in students an appreciation of the importance of organometallic chemistry in an industrial, economic, environmental and social context.

#### Course Intended Learning Outcomes (ILOs) and their Alignment with Program ILOs:

Upon successful completion of this course, students are expected to achieve the following learning outcomes:

Course ILOs	Program ILOs	Teaching and Learning Method	Assessment Method
<b>Knowledge (K)</b>			
2. Demonstrate the importance and applications of catalysis and catalysts.	K1	Lectures, Discussions, & H.W	Exams, Quizzez
<b>Intellectual Skills (I)</b>			
- Study Bonding , structures & reactions of organometallic molecules.	I1	Lectures, Discussions, & H.W	Exams, Quizzez
- Correlate different structural features with their specific properties	I2		
<b>Transferable Skills (I)</b>			
Not applicable			

#### Assessment Methods:

Method	Lectures and Discussions
Contact Hours	3 hrs / week

Assessment method	Grade	Comments
1 <sup>st</sup> exam	30	11-04-2019
2 <sup>nd</sup> exam	30	16-05-2019
Activity	-	
Final	40	Set by registrar
<b>Total</b>	<b>100</b>	

#### Alignment of Teaching and Learning Methods, Assessment and Course ILOs:

Teaching method	Contact Hours	Assessed through	ILOs numbers
Lectures and Discussions	3 hrs /week	Exams, Reaction of students in lectures & Homework's	All ILOs

#### Learning References:

<b>1- Textbook (s) :</b> Inorganic Chemistry, by D. F. Shriver, P. W. Atkins and C.H. Langford.,3 <sup>rd</sup> ed.or 4 <sup>th</sup> ed.
<b>2- References:</b> 1) Inorganic Chemistry, Principles of Structure and Reactivity, By J. E. Huheey E. A. Keiter and R. L. Keiter.,4 <sup>th</sup> ed. ; 546 / H 899 2) Inorganic Chem., By Gary L. Miessler and Donald A Tarr., 2 <sup>nd</sup> ed.; 546/M631 3) Inorganic Chem., Principles and Applications.,By Ian S.Butler and John F. Harrod. ; 546/B985 4) Internet notes.
<b>3- Other Resources:</b> <<Labs, computer resources, lecture rooms needed for the course>>

#### Grading Scale :

93-100 A ; 86-92 A<sup>+</sup> ; 80-85 B<sup>+</sup> ; 75-79 B ; 70-74 B<sup>-</sup> ; 65-69 C<sup>+</sup> ; 60-64 C ; 56-59 C<sup>-</sup> ; 53-55 D<sup>+</sup> ; 50-52 D ; 45-49 D<sup>-</sup>

**Course Schedule:**

Week	Topics	Topic Details	Course ILOs #	Reference
1	Introduction, Historical background		I1	Chap.15, shriver; chap.13 Miessler
2	Main-group organometallic compounds	15.1 nomenclature, 15.2 comparison with hydrogn compounds, 15.3 structure and bonding, 15.4 stability, 15.5 synthesis,	I1,I2	Chap.15, shriver; chap.13 Miessler
3		15.6 reaction patterns, 15.7 alkali metals, 15.8 alkaline earth mtals, 15.9 The zinc group.	I1,I2	Chap.15, shriver;
4		15.10 organoboron compounds, 15.11 organoaluminum compounds, 15.12 organometallic compounds of Ga,In,Tl	I,I21	Chap.15, shriver;
5		15.13 organosilicon compounds,	I1,I2	Chap.15, shriver;
6		15.14 organometallic compounds of Ge,Sn,Pb, organometallic compounds of As,Sb,Bi, 15.16 Catenated and multiply bonded compounds.	I1,I2	Chap.15, shriver;
7	d- and f- block organometallic compounds	Nomenclature, hapticity, bonding, 16.1 valence electron count, 16.2 oxidation numbers and formal ligand charges.	I1,I2	Chap.16, shriver
8	d- block carbonyls	16.3 carbon monoxide as a ligand, 16.4 Synthesis of Metal Carbonyls, 16.5 Structure 16.6 Properties and Reactions of Metal Carbonyls,	I1,I2	Chap.16, shriver
9	Other Organometallic Compounds :	16.7 Hydrogen and open chain hydrocarbon ligands.	I1,I2	Chap.16, shriver
10-12	catalysis	Definition, Importance, General concepts, 17.1 Description of catalysts., Catalytic efficiency,Catalytic cycles, Energetics., Properties of catalysts, Selectivity,Lifetime, Homogeneous catalysis, Catalytic steps a. Ligand coordination and dissociation, b. Insertion and elimination. c. Nucleophilic attack on coordinated ligands, d. Oxidation and reduction, e. Oxidative addition and reductive elimination, 17.4 Examples/shriver, Wilkinson's Catalyst : Butler, a. Hydrogenation of alkenes, b. Hydroformylation, c. "Monsanto" acetic acid synthesis, d. Wacker oxidation of alkenes., e. Alkene polymerization, 17.5 Heterogeneous Catalysis, a. Surface area and porosity. b. Surface acidic & basic sites. c. Surface metal sites., 17.6 Catalytic steps.; a. Chemisorption and desorption., 17.7 Examples/shriver a. Hydrogenation of alkenes, b. Ammonia synthesis c. SO <sub>2</sub> oxidation / production of H <sub>2</sub> SO <sub>4</sub> , d. Interconversion of aromatics by zeolites	K1	Chap.17 shriver
13-14	superconductors	<b><i>What is a Superconductor ?</i></b> <b><i>The History of Superconductors Uses for Superconductors</i></b> <b><i>Type 1 Superconductors : metals &amp; metalloids Type 2 Superconductors :</i></b> - metallic compounds & alloys - V, Tc & Nb ; - nanotubes of C, Si, BN, WS <sub>2</sub> ; - HT-ceramic superconductors <b><i>Atypical Superconductors :</i></b> Fullerenes & Metal Fullerenes ,Boron Carbides,polymers.		Net

**Course Policies<sup>1</sup>**

- **Attendance Policy:** University regulations apply to attendance.
- **Academic Honesty:** Academic dishonesty is an unacceptable mode of conduct, and will not be tolerated in any form at University of Petra. All persons involved in academic dishonesty and plagiarism in any form will be disciplined in accordance with University rules and regulations.
- No cell phones in the exams.

Approved by	Name	Date	Signature
Head of Department	Dr. Abdelmnim Altwaiq	23/02/2020	
Faculty Dean	Prof. Dr. Rami Abdel-Rahem	25/02/2020	

<sup>1</sup> Additional information may be added in this section according to the nature of the course.