



# Course Specification

## (Bachelor)

Course Title: **Organometallics Chemistry**

Course Code: **CEM353**

Program: **General Chemistry, Industrial Chemistry**

Department: **Chemistry**

College: **College Of Science**

Institution: **Majmaah University**

Version: **TP-153**

Last Revision Date: **16 December 2024**



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## A. General information about the course:

### 1. Course Identification

1. Credit hours: (2h)

2. Course type

A.  University  College  Department  Track  Others

B.  Required  Elective

3. Level/year at which this course is offered: ( 6<sup>th</sup> Level / 3<sup>rd</sup> Year)

4. Course General Description:

The course introduces the synthesis and theory of structure, bonding, and reactivity of transition metal compounds. This includes different types of ligands and their bonding modes, ligand substitutions reactivity. The primary emphasis will be on the fundamentals of organometallic reactions, and their relevance to important processes in industrial catalysis and organic synthesis including the basic principle of catalysis, and how its efficiency is measured. Two lecture hours per week. Two Credit hours. Prerequisite CEM352

5. Pre-requirements for this course (if any):

Coordination Chemistry CEM352

6. Co-requisites for this course (if any):

7. Course Main Objective(s):

The main objective of this course is to familiarize students with the fundamental principles of organometallic chemistry which plays a primordial role in the catalytic processes. By completing this course, students are expected to:

- Understand the basic principles that govern electronics, structure and bonding in organometallic complexes.
  - Learn about the common organometallic compounds and their synthesis.
  - Learn about applications of organometallic chemistry including catalytic reactions for organic synthesis and polymerization
- Be able to give reasonable mechanisms for the most important catalytic cycles.

2. Teaching mode (mark all that apply)



No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	30	100%
2	E-learning		
3	Hybrid <ul style="list-style-type: none"> <li>• Traditional classroom</li> <li>• E-learning</li> </ul>		
4	Distance learning		

### 3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	Lectures	30
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	
5.	Others (specify)	
<b>Total</b>		<b>30</b>

## B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
<b>1.0</b>	<b>Knowledge and understanding</b>			
1.1	Demonstrate knowledge and understanding of essential principles relating to organometallic chemistry.	<b>K1</b>	- lectures (PowerPoint) and Video related to the topic.	- Midterms - Quizzes - Homework
1.2	Analysis the chemical behavior and reactivity of organometallic compounds	<b>K3</b>	- Discussions	- Class participation - Encourage students to
1.3	Explain the chemical transformations of organometallics in catalytic cycle.	<b>K3</b>	- E-learning - Self-learning	search the Internet for





Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
				everything related to - Homework on the blackboard - Final exam - E-exam.
<b>2.0</b>	<b>Skills</b>			
2.1	Explain the fundamental organometallic reactions	<b>S2</b>	Cooperative learning	
2.2	Apply knowledge of organometallic chemistry and catalysis to synthesize complex organic molecules.	<b>S3</b>	- Problem Solving - Interactive teaching - Discussion and dialogue - Active Learning - Peer Learning - Encourage students to work as team in order To raise the spirit of cooperation among students	- Assignment - Homework - Midterm Exam - Final Exam - Research papers Request a share Presentation and homework and then presented them on the class. - Present a presentation for each group
<b>3.0</b>	<b>Values, autonomy, and responsibility</b>			
3.1	act responsibly and ethically in carrying out assigned tasks.	<b>V1</b>	Assignments (individual or group) at regular intervals to solve and submit on time. • Participation of students in classroom discussion and problem solving sessions	- Observing student's participation in group activity. - Checklist of the tasks carried out by the student. Observing student's participation in



Code	Course Learning Outcomes	Code of PLOs aligned with the program	Teaching Strategies	Assessment Methods
			<ul style="list-style-type: none"> <li>Team work reports and presentations (data collection, internet search, data processing, analysis and reporting)</li> </ul>	group discussion. - Checklist of student's punctuality in submitting work on time.

### C. Course Content

No	List of Topics	Contact Hours
1.	Introduction and Background Features of Organometallic Complexes Periodic Trends of Transition Metals Electron Counting and the 18 e <sup>-</sup> Rule	8
2.	Survey of Organometallic Ligands Metal-Ligand Types -Preparation -Reaction -Bonding	8
3.	Fundamental Reactions of Organometallic Compounds Ligand Substitution Oxidative Addition Reductive Elimination Migratory Insertion and Elimination Nucleophilic/Electrophilic Attack on Coordinated Ligands	8
4.	Catalysis Alkyne Metathesis Coupling Reactions	6
<b>Total</b>		<b>30</b>

### D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homework	Continues	5%
2.	Quizzes	End of topic	5%
3.	Presentation	One/semester	10%
4.	midterm exam 1	7 <sup>th</sup>	15%
5.	midterm exam 2	12 <sup>th</sup>	15%





No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
6.	E. exam	15 <sup>th</sup>	10%
7.	Final Theoretical exam	18 <sup>th</sup>	40%

\*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

## E. Learning Resources and Facilities

### 1. References and Learning Resources

<b>Essential References</b>	Elschenbroich, Ch.; Organometallics, 3rd Ed.; Wiley-VCH: Weinheim, Germany, 2005. B.D. Gupta, Anil J. Elias "Basic Organometallic Chemistry: Concepts, Syntheses and Applications" 2013, Universities Press.
<b>Supportive References</b>	1. Organotransition Metal Chemistry. From Bonding to Catalysis. Edited by John F. Hartwig. The Organometallic chemistry of the transition metals. Edited by Robert H. Crabtree.
<b>Electronic Materials</b>	Relevant Website
<b>Other Learning Materials</b>	PowerPoint presentation. Interactive and multimedia soft-books

### 2. Required Facilities and equipment

Items	Resources
<b>facilities</b> (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms, E- learning, balckboard
<b>Technology equipment</b> (projector, smart board, software)	data show, Smart Board
<b>Other equipment</b> (depending on the nature of the specialty)	None

## F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	students	Questionnaire evaluation of the course. Indirect
Effectiveness of Students assessment	Program/Department Instructor	Annual course report.Direct
Quality of learning resources	Program/Department Instructor	Annual course report. Direct
The extent to which CLOs have been achieved	Peer review	- Check marking of a sample of exam papers, or student work.





Assessment Areas/Issues	Assessor	Assessment Methods
		-Exchange corrected sample of assignments or exam basis with another staff member for the same course in other faculty. Direct
Other		

**Assessors** (Students, Faculty, Program Leaders, Peer Reviewers, Others (specify))

**Assessment Methods** (Direct, Indirect)

### G. Specification Approval

<b>COUNCIL /COMMITTEE</b>	<b>CHEMISTRY DEPARTMENT COUNCIL</b>
<b>REFERENCE NO.</b>	<b>17</b>
<b>DATE</b>	<b>16-12-2024</b>

