The University of Jordan

Accreditation & Quality Assurance Center

Course Syllabus

Experimental Inorganic Chemistry (0303326)

1	Course title	Experimental Inorganic Chemistry
2	Course number	0303326
3	Credit hours (theory, practical)	3
	Contact hours (theory, practical)	(1 Theory + 5 Practical)
4	Prerequisites/corequisites	0303321
5	Program title	B.Sc. in Chemistry
6	Program code	3
7	Awarding institution	The University of Jordan
8	Faculty	Faculty of Science
9	Department	Chemistry
10	Level of course	Bachelor/Undergraduate
11	Year of study and semester (s)	3rd Year Students- 2023/20234, 1st Semester
12	Final Qualification	B.Sc. in Chemistry
13	Other department (s) involved in teaching the course	N.A.
14	Language of Instruction	English
15	Date of production/revision	5/10/2023

16. Course Coordinator:

Office numbers, office hours, phone numbers, and email addresses should be listed.
Associate Professor Afnan Al-Hunaiti
Office 32, Office Hours: 9-11 STT,
Ext. 22135, a.alhunaiti@ju.edu.jo,

17. Other instructors:

Office numbers, office hours, phone numbers, and email addresses should be listed.
N.A

18. Course Description:

As stated in the approved study plan.
Synthesis of selected transition and non-transition metal complexes and study of their chemical; magnetic; conductance and spectral properties. The course also includes a series of lectures covering the theoretical aspects of inorganic synthesis and structure elucidation.

19. Course aims and outcomes:

A- Aims:

A- Aims: The aim of this course is to provide the students with the required experience to synthesize and characterize
transition and non-transition metal complexes. The aim of the theoretical part is providing the student with the necessary knowledge concerning synthesis techniques for various types of complexes and to revise and apply various tool for the characterization of these complexes, including conductance measurement, magnetic susceptibility measurement, UV-visible spectra, IR spectra and NMR spectra.
Four one hour lectures will have given in first week and 3 more in second week.

B- Intended Learning Outcomes (ILOs): Upon successful completion of this course students will be able to …

A- Theoretical Part:

A1- Know the rules for lab work, safety rules and what to do in cases of emergency.

A2- Perform calculation of molar conductance and conclude number of ions in solution.

A3- Perform molar mass calculations(for non-ionic complexes) and determine number of ligands bonded to metal ion.

A4- Analyze the UV-visible spectra of metal complexes, calculate the values of molar absorbtivities (extinction coefficients) and assign absorption bands and calculate the values of Δ_o or Δ_t values, and get required information about structure or shape of complex

A5- Perform magnetic calculations, magnetic susceptibilities and magnetic moments and decide the number of unpaired electrons, the spin state of the complex , the oxidation state of the metal ion and shape of the complex.

A6- Analyze the IR spectra of ligands and metal complexes and determine the mode of bonding between metal ion and Ligand donor atoms.

A7- Analyze the NMR spectra of ligands and metal complexes(for diamagnetic complexes) and determine the mode of bonding between metal ion an ligand donor atoms.

A8- Understand the thermodynamics for the synthesis and understand the stability constants of complexes.

A9- Understand the kinetic of synthesis of metal complexes and mechanism for synthesis, decomposition, isomerization and racemisation.

B- Experimental part, the student will perform the following:

B1- The synthesis of complexes, about 15 different complexes.

B2- For each of the prepared complexes the student will purify the complex by the recrystallization from suitable solvent and perform the following measurements:
Melting point.
Molar mass determination, by freezing point measurement (for non-ionic complexes).
Conductance for a mmolar solution in a suitable solvent.

B3- For each complex prepared the UV-visible, IR and some NMR spectra will be recorded.

B4- Upon completion of lab work the student will be required to hand out the prepared complexes and write a lab report including all data obtained , all performed calculations and conclusions about the structure and properties of the complex.

20. Topic Outline and Schedule:

Topic	Week	Instructor	Achieved ILOs	Evaluation Methods	Reference
1. Introduction and safety rules	1	Afnan Al-Hunaiti	A1	Observation of work and work evaluation	Lab manual
2.Molar conductance	1	Afnan Al-Hunaiti	A2+ B1-B4	Observation of work and mid-term	Lab manual
3.Molar mass measurements	1	Afnan Al-Hunaiti	A3+ B1-B4	Observation of work and mid-term	Lab manual
4.UV-visible spectra	2	Afnan Al-Hunaiti	A4+ B1-B4	Observation of work and mid-term	Lab manual
5. Magnetic measurements	2	Afnan Al-Hunaiti	A5+ B1-B4	Lab reports, Observation of work and mid-term	Lab manual
6. IR spectra	3	Afnan Al-Hunaiti	A6+ B1-B4	Lab reports, Observation of work and mid-term	Lab manual
7.NMR spectra	4	Afnan Al-Hunaiti	A7+ B1-B4	Lab reports, Observation of work and mid-term	Lab manual
8.Thermodynamic aspects of synthesis	5	Afnan Al-Hunaiti	A8+ B1-B4	Lab reports, Observation of work and mid-term	Lab manual
9.Kinetic aspects of synthesis	6	Afnan Al-Hunaiti	A6+ B1-B4	Lab reports, Observation of work and mid-term	Lab manual
10.Discussion of results	7	Afnan Al-Hunaiti	A6+ B1-B4	Lab reports, Observation of work and mid-term	Lab manual
11- Lab Work	8-14	Afnan Al-Hunaiti	B1-B4	Lab reports, Observation of work and mid-term	Lab manual

21. Teaching Methods and Assignments:

Development of ILOs is promoted through the following teaching and learning methods:
Chalk and talk, hand outs, homework and data show slides.

22. Evaluation Methods and Course Requirements:

Opportunities to demonstrate achievement of the ILOs are provided through the following assessment methods and requirements:

Evaluation of understanding lab work through discussions with students during lab work, oral mid-term, quality of products, lab reports and final examination. Grades are distributed as follows:
Quality of products: 15%
Lab Reports: 15%
Evaluation of student work: 10 %
Final Examination: 40 %

23. Course Policies:

A- Attendance policies: All students are expected to follow the of attendance policies of the University of Jordan, absences exceeding 15% of total number of class meeting (6 hour classes) will result in F grade or course drop.

B- Absences from exams and handing in assignments on time: University rules and regulations regarding make-up exams.

C- Health and safety procedures: N/A

D- Honesty policy regarding cheating, plagiarism, misbehavior: University rules and regulations.

E- Grading policy: University rules and regulations

F- Available university services that support achievement in the course: N/A

24. Required equipment:

The laboratory is provided with all required equipment

25. References:

A-Required book (s), assigned reading and audio-visuals:

A- Recommended books, materials, and media:

1.Bailar, J. C., Jones, E.M. (1939) *Inorg. Synth.*, 1, 37.
2.Charles, R.G. (1963) *Inorganic Synthe*sis 7, 183-184.
3.Collman, J.P. (1965). *Angew. Chem. Int. Ed.* 4, 132-138.
4.Collman, J.P. Goldby, S., Young, W.L. III & Marshall, R. (1962). *Inorg. Chem.* 1, 704-710.
5.Collman, J.P., Young, W.L. III & Kauffman, G.B. (1963). *Inorg. Synth*. 7, 205-207.
6.Combes, C.R., (1890). *Acad. Sci.*, iii 272.
7.Goodgame, D.M.L. *et. al*, (1965), *Inorg. Chem.* 4, 823.
8. Szafran,Zvi;Pike,R.M and Singh,M,M,Wiley(1991).

26. Additional information:

Name of Course Coordinator: Dr. Afnan Al-Hunaiti Signature: ----------

Date: -5/3 /2023---------- Head of curriculum committee/Department: ----------

Signature: ----------

Head of Department: ---------- Signature: ----------

Head of curriculum committee/Faculty: ---------- Signature: ----------

Dean: ---------- -Signature: ----------

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Head of Department
Assistant Dean for Quality Assurance
Course File