جامعة الملك عبدالله
للعلوم والتقنية
King Abdullah University of
Science and Technology

Course Syllabus: Advanced Inorganic Chemistry I - ChemS 330

Division	Physical Science and Engineering Division
Course Number	ChemS 330
Course Title	Advanced Inorganic Chemistry I
Academic Semester	Fall
Academic Year	2019/2020
Semester Start Date	08/25/2019
Semester End Date	12/10/2019
Class Schedule (Days & Time)	09:00 AM - 10:30 AM | Mon Thu

Instructor(s)

Name	Email	Phone	Office Location	Office Hours
Mohamed Eddaoudi	mohamed.eddaoudi@kaust.edu.sa	+966128082778		By appointment (preferably via e-mail: mohamed.eddaoudi@kaust.edu.sa)
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Teaching Assistant(s)

Name	Email
NA	NA

Course Information

Comprehensive Course Description	An understanding of the material covered in basic inorganic chemistry is expected. An understanding of basic organic chemistry (structure and nomenclature) is also important. The course is designed to present students with a descriptive overview of inorganic chemistry with particular emphasis on structure/reactivity at both the molecular and supramolecular levels. There will also be an emphasis on solid-state chemistry, Crystal Chemistry, Microporous Materials, Metal-Organic Materials (MOMs) and X-ray Crystallography. Initial lectures will cover background and theoretical principles for understanding molecular symmetry, bonding and coordination chemistry.
Course Description from Program Guide	Generalizations of the periodic table and their relationship to classical and modern concepts of atomic and molecular structure. Inorganic stereochemistry including concepts of crystal chemistry, silicate chemistry, coordination theory, ligand field theory, catalysis, acid-base theory, reaction mechanisms, organometallic chemistry and a detailed consideration of selected groups of the periodic table.

Goals and Objectives	The students will gain the requisite knowledge and skills to understand inorganic and hybrid organic-inorganic compounds (discrete coordination compounds and extended solids) and how their intrinsic structures are correlated with their properties. The acquired knowledge includes: ■ Importance of molecular symmetry and its applications. ■ Understanding Structure/reactivity at both the molecular and supramolecular levels. ■ Understanding solid state materials structures in term of their structures. ■ Understanding the basics of crystallography including space groups and their meanings ■ Understanding the basic of topology and its importance in understanding and designing extending solids. ■ Metal-organic frameworks design, structures and properties.
Required Knowledge	■ An understanding of the material covered in basic inorganic chemistry is expected. ■ An understanding of basic organic chemistry (structure and nomenclature) is also important.
Reference Texts	***Several topics are not covered well in the texts. Lecture handouts and related peer reviewed published papers will be provided as appropriate.*** **Lecture Texts**: Recommended Books (for reference only): ■ "*Basic Inorganic Chemistry*" by Cotton. ■ "Inorganic Chemistry" 3rd *ed.* 2003, Gary L. Miessler and Donald A. Tarr. ■ "*Advanced Inorganic Chemistry*" by Cotton and Wilkinson. ■ "*Chemistry of the Elements*" by Greenwood and Earnshaw ■ "*Supramolecular Chemistry*" by J.-M. Lehn. ■ *"Crystal Structures I: Patterns and Symmetry"* by M. O'Keeffe and B. G. Hyde
Method of evaluation	**25.00**% - Final exam **25.00**% - Presentation **25.00**% - Exam 2 **25.00**% - Exam 1
Nature of the assignments	**Exams:** A total of three exams will be given, two during the regular semester and the final exam during the final exam period. The two first exams will count 25% each toward your final grade. ***There are no Make-up exams for this Class.*** ■ **Final exam:** Will include all topics covered in the course. ■ ***Presentations by graduate students:*** Hot topics from current literature – material could also appear on the final exam. Graduate students will be assigned an article from recent scientific literature or the name of a famous chemist. They will be expected to write a 5 page word processed report due on November 26th, provide a one page abstract and make a 20 minute presentation using up to 15 slides. ■ **Grading Scheme:** -Tests **2 x 25%** -Final Presentation(s) **25%** -Final Exam **25%**
Course Policies	■ ***All students are expected to attend the lectures:*** Attendance to class is expected. If any class session is missed, it is the responsibility of the student to find out if any assignments or schedule changes were made during the missed class. ■ ***There are no Make-up exams for this Class.***
Additional Information	**Final course grades will be assigned according to the chart below:** A+ 90 % -100 % A 86 % -90 % A- 82 % -86 % B+ 78 % -82 % B 74 % -78 % B- 70 % -74 % C+ 66 % -70 % C 62 % -66 % C- 58 % -62 % D 45 % -58 % F below 45%

Tentative Course Schedule

(Time, topic/emphasis & resources)

Week	Lectures	Topic
1	Mon 08/26/2019	Introduction of the topics to be covered in the Class
1	Thu 08/29/2019	Background and theoretical principles for understanding nuclear and electronic structure of atoms. Molecular structure and the VSEPR approach (Lecture 1).
2	Mon 09/02/2019	Background and theoretical principles for understanding nuclear and electronic structure of atoms. Molecular structure and the VSEPR approach (Lecture 2).
2	Thu 09/05/2019	Background and theoretical principles for understanding nuclear and electronic structure of atoms. Molecular structure and the VSEPR approach (Lecture 2 continue).
3	Mon 09/09/2019	Symmetry and Group Theory: Symmetry, symmetry elements, and symmetry operations (Lecture 3)
3	Thu 09/12/2019	Symmetry and Group Theory: Point Group; Character Tables (Lecture 4)
4	Mon 09/16/2019	Symmetry and Group Theory: Group theory treatment of polyatomic molecules (Molecular orbital diagram - Ligand Group theory, LGO's). (Lecture 5)
4	Thu 09/19/2019	Symmetry and Group Theory: Group theory treatment of polyatomic molecules (Molecular orbital diagram - Ligand Group theory, LGO's). (Lecture 6)
5	Mon 09/23/2019	Saudi National Day
5	Thu 09/26/2019	Coordination Chemistry: (Lecture 7) Basic considerations in d-block coordination chemistry Basic crystal field theory MO theory approach to bonding in transition metal coordination complexes
6	Mon 09/30/2019	Coordination Chemistry: (Lecture 8) Basic considerations in d-block coordination chemistry Basic crystal field theory MO theory approach to bonding in transition metal coordination complexes
6	Thu 10/03/2019	Organometallic chemistry: (Lecture 9) 18-electron rule Spectral analysis of organometallic complexes Structure and bonding in organometallics; Catalysis, reactions of organometallics
7	Mon 10/07/2019	Organometallic chemistry: (Lecture 10) 18-electron rule Spectral analysis of organometallic complexes Structure and bonding in organometallics; Catalysis, reactions of organometallic
7	Thu 10/10/2019	Exam1
8	Mon 10/14/2019	Solid State Chemistry and Intro to Crystallography: (Lecture 11)
8	Thu 10/17/2019	Solid State Chemistry and Intro to Crystallography: (Lecture 12)
9	Mon 10/21/2019	Solid State Chemistry and Intro to Crystallography: (Lecture 13)
9	Thu 10/24/2019	Solid State Chemistry and Intro to Crystallography: (Lecture 14)
10	Mon 10/28/2019	Mid-semester break
10	Thu 10/31/2019	Metal-organic Materials: Crystal Chemistry - structures and nets. (Lecture 15)
11	Mon 11/04/2019	Metal-organic Materials: Crystal Chemistry - structures and nets. (Lecture 16)
11	Thu 11/07/2019	Metal-organic Materials: Crystal Chemistry - structures and nets. (Lecture 17)
12	Mon 11/11/2019	Metal-organic Materials: Crystal Chemistry - structures and nets. (Lecture 18)
12	Thu 11/14/2019	Metal-organic Materials: Crystal Chemistry - structures and nets. (Lecture 19)
13	Mon 11/18/2019	Metal-organic Materials: Crystal Chemistry - structures and nets. (Lecture 20)
13	Thu 11/21/2019	Exam 2
14	Mon 11/25/2019	Presentations by Students (1): Hot topics from current literature – material could also appear on the final exam. Graduate students will be assigned an article from recent scientific literature or the name of a famous chemist. They will be expected to write a 5 page word processed report due on November 18th, provide a one page abstract and make a 20 minute presentation using up to 15 slides
14	Thu 11/28/2019	Presentations by Students (2).

15	Mon 12/02/2019	Presentations by Students (3).
15	Thu 12/05/2019	Final Exam (Including all the topics covered in the course)
16	Mon 12/09/2019	Exams

Note

The instructor reserves the right to make changes to this syllabus as necessary.