**Physical Methods in Inorganic Chemistry, 523 Chem. (2+0(  
Methods and Objectives**

**Catalogue Description**: *Magnetism, electronic spectroscopy, magnetic resonance (NMR), electronic paramagnetic resonance (E.P.R) nuclear quadropole resonance (N.Q.R.), Mössbauer spectroscopy, mass spectroscopy and x-ray single crystal analysis.*

*Course Objectives*

This course was designed to offer students a deeper understanding of the concepts behind physical methods used in studying inorganic compounds with transition metal compounds in particular. A non-mathematical approach focusing on fundamental, rather than analytical aspects was adopted, with molecular symmetry in mind. A substantial portion of descriptive chemistry, which requires careful reading *and* retaining of gained knowledge, is included in this class. Examples of interpretation of data of physical methods with regard to structure and properties of the compounds will be investigated independently. Electronic spectroscopy, magnetism and X-ray crystallography are the methods covered in lectures.

**Course Outcomes**

1. Students will be able to understand and use data from different physical methods to elucidate structures of transition metal compounds.
2. Students will be able to explain the relationship between data from the physical methods studied and structure-related properties of a compound.
3. Students will be able to identify the validity of methods studied for transition metal compounds.
4. Students will become familiar with developments in the field of UV/Vis spectroscopy, magnetism and X-ray powder diffraction.
5. Students will gain skills in independent reading, and writing a critical review.

**Learning Content and Delivery**

In this course, fundamental rather than analytical aspects will be tackled with a stress on the importance of molecular symmetry. A non-mathematical approach will be adopted to cover the following methods in structure elucidation of transition metal Compounds:

* **Electronic Spectroscopy:** *Introduction to electronic spectroscopy, molecular symmetry, terms and configurations, microstates, selection rules, d-d spectra, charge transfer spectra.(lectures)*
* **Magnetism:** *Classes of magnetic materials, magnetic moments, orbital contribution, temperature dependence, magnetic interactions (lectures)*
* **Powder X-ray Diffraction:** *X-rays and matter, PXRD, phase identification, structure analysis. (lectures)*
* **Physical Methods in Characterizing Coordination Compound:**
* **Reading Assignment**1: *The student should prepare for an oral discussion on the contents of the chapter and their connection with other content of the course. (Independent reading)****.*** *A summary report should be written according to a template2.*
* **Written critical paper review and presentation3:** *The student will be required to write a critical review of a recent research paper assigned by the instructor. A presentation of the review will be evaluated by faculty from the department.*

*1* *Chapter 4 (Experimental Techniques), Inorganic Chemistry, C. E. Housecroft and A. G. Sharpe, Pearson.*

[*http://web.uni-plovdiv.bg/plamenpenchev/mag/books/inorgchem/Inorganic%20Chemistry%20-%20Catherine%20E.%20Housecroft%20And%20Alan%20G.%20Sharpe%202nd%20Edition.pdf*](http://web.uni-plovdiv.bg/plamenpenchev/mag/books/inorgchem/Inorganic%20Chemistry%20-%20Catherine%20E.%20Housecroft%20And%20Alan%20G.%20Sharpe%202nd%20Edition.pdf)

*2 Independent reading summary report template (at LMS.)*

*3 PPT on how to write a critical review.*

***Handouts and Supporting Materials***

* Handouts and sample tests for this class will be available at [www.lms.ksu.edu.sa](http://www.lms.ksu.edu.sa)
* Supplementary material will be available by arrangement.

**Evaluation**

* Rubrics for evaluating and grading the written review and presentation will be used (find at LMS).
* All exam questions will be essay-type.

**Grading**

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| --- | --- |
|  | **Marks** |
| Midterm exam. | **20** |
| Written critical review & presentation | **30** |
| Reading Assignment report and oral discussion | **10** |
| Final exam | **40** |
| Total | **100** |

**Course Calendar**

|  |  |  |
| --- | --- | --- |
|  | Week | Date |
| Midterm examination | 7 | 31/10/2017 |
| Reading assignment | 9 | 14/11/2017 |
| Critical review report and presentation | 12 | 5/12/2017 |
| Final Examination\* | 15 | Upon agreement |

\*The final exam will cover the entire course (comprehensive).

***Reading List***

1. C. E. Housecroft and A. G. Sharpe, Inorganic Chemistry, Pearson.
2. A.B.P. Lever, Inorganic Electronic Spectroscopy, 1984, Elsevier.
3. F. E. Mabbs and D. J. Machin, Magnetism and Transition Metal Complexes, 2008, Dover Publications
4. B.D. Cullity and S. R. Stock, Elements of X-Ray Diffraction, 2001.

**Instructor's Expectations**

**1) Appropriate background** of fundamentals of: Group Theory, Electronic Spectra of Transition metal compounds, IR spectroscopy, Solid State Chemistry, Crystallography.

**2) Attitude**: Attentiveness, seeking help and asking questions when something is not clear or not well understood.

**3) Attendance** is a necessary condition for receiving of solid knowledge of the subject and a good grade. Therefore, all lectures should be attended.

4) The schedule **may be** modified throughout the course, as needed. **And the student is expected to cope.**

**Obtaining Assistance** Do not hesitate to contact the instructor during office hours or via e-mail.

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***Instructor's Information***

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