

INSTITUTE	FACULTY OF SCIENCE
PROGRAM	MASTER OF SCIENCE (CHEMISTRY)
SEMESTER	1
COURSE TITLE	INORGANIC CHEMISTRY-I
COURSE CODE	02CY0408
COURSE CREDITS	4

Objective:

- 1 Understand the key features of coordination compounds, including the variety of structures, oxidation numbers, electronic configurations and stability of complexes.
- 2 Acquire the knowledge of magneto chemistry to understand the magnetic properties and the colour of coordination compounds.
- 3 Learn about Electron Spin Resonance spectroscopy for transition metal complexes.
- 4 Achieve the basic knowledge of organometallic compounds and explore the important aspects of organometallic compounds.

Course Outcomes: After completion of this course, student will be able to:

- 1 Explain the fundamental concepts in coordination chemistry of transition metals.
- 2 Able to use the concept of magneto chemistry to explain the various magnetic properties of transition metal complexes.
- 3 Apply the concept of ESR spectroscopy to explain the reactions of transition metal complexes.
- 4 Realize the importance of organometallic compounds in research and chemical industry.

Pre-requisite of course: Before studying Inorganic chemistry, all students have basic knowledge of inorganic and organic compounds, molecular structure, Molecular orbital theories and knowledge related to UG level chemistry.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	Coordination Compounds Double salts, Coordination compounds, Coordination complexes and complex ions, Coordination number, various types of ligands, Color of coordination compounds, chelates, Effective atomic number, Valance bond theory, Crystal field theory, Crystal field splitting of energy levels, Crystal field stabilization energy, Magnetic properties of metal complexes, Ligand field theory, Jahn-Teller effect.	20

Contents : Unit	Topics	Contact Hours
2	Magneto Chemistry Definition, Ferromagnetism, Anti-ferromagnetism, Ferri-magnetisms, Diamagnetism and Pascal's Constant, Russell-Saunders (RS) or LS Coupling, Relations between Multiple width to kT, Stereo chemical applications of Magnetic Properties of the First Transition Series, Lanthanides and actinides, Determination of magnetic susceptibility by Gouy's Method.	15
3	Electron Spin Resonance Theory of ESR, ESR applications for the structure determination of metal complexes, Applications of ESR for understanding metal complexes relevant to biology. Interaction between nuclear spin and electron spin.	10
4	Organometallic Compounds Introduction, classification of organometallic compounds, ionic organometallic compounds, organometallic compounds having metal-carbon sigma bond, organometallic compounds of Group 2, Group 12, Group 13, Group 14, Group 15 and transition metals, Organometallic compounds with pi bond ligands, ferrocene, Zeise's salt, reactions of ferrocene and its aromaticity, hapticity, 18-electron rule, counting of effective atomic numbers, isolobal analogy and nomenclature of organometallic compounds.	15
Total Hours		60

Textbook :

- 1 Basic Organometallic Chemistry, Anil Elias and Gupta B.D., Universities Press, 2013
- 2 A Textbook of Inorganic Chemistry, Mandeep Dalal , Dalal Institute , 2017

References:

- 1 Magnetochemistry , Magnetochemistry , Pierce W. Selwood , Read Books, 2008
- 2 Organometallic Chemistry : A Unified Approach , Organometallic Chemistry : A Unified Approach , R.C. Mehrotra , newagepublishers, 2020
- 3 Coordination Chemistry , Coordination Chemistry , AJAI KUMAR , Aaryush Education, 2020
- 4 Electron Spin Resonance: A Comprehensive Treatise on Experimental Techniques, Electron Spin Resonance: A Comprehensive Treatise on Experimental Techniques, Charles P. Poole Jr. , Dover Publications, 1997
- 5 Organometallic Compounds: Synthesis, Reactions, and Applications, Organometallic Compounds: Synthesis, Reactions, and Applications, Dakeshwar Kumar Verma, Jeenat Aslam, Wiley-VCH GmbH, 2023

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- 3 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

Supplementary Resources:

- 1 <http://www.nptel.ac.in/courses/104103069/#>
- 2 <http://ocw.mit.edu/courses/chemistry/>
- 3 http://www.vlab.co.in/ba_labs_all.php?id=9
- 4 https://www.youtube.com/watch?v=BZ_tY88o0oI&list=PLbMVogVj5nJTWU1tCPCtLBaiWNsJRAiZZ
- 5 <https://www.youtube.com/watch?v=E12FqEZLiSk&list=PLsjwzhExMPOD23ZU1VcxhBII2udnbxTPg>
- 6 https://www.youtube.com/watch?v=vjJIVOVqsPo&list=PLDjIJRH6sIC7nezW89_ljE-BMttNOjYJ5
- 7 <http://www.nptel.ac.in/courses/104103069/#> 2. <http://ocw.mit.edu/courses/chemistry/> 3. <http://vlab.amrita.edu/index.php?sub=2>