National Institute of Technology, Tiruchirappalli–620015

Department of Chemistry

COURSE PLAN			
Course Title	Coordination Chemistry and its Applications		
Course Code	CHMI10	**No. of Credits**	3
Department	Chemistry	**Faculty**	Dr. G. Venkatesa Prabhu Dr. Shima P. Damodaran Dr. S. Amudhan Senthan
Pre-requisites Course Code	NA		
Course Coordinator (if, applicable)	Dr. G. Venkatesa Prabhu		
E-mail	venkates@nitt.edu shimapd@gmail.com amudhansenthan.s@gmail.com	**Mobile No.**	+91 9894080616 +91 9447956884 +91 9840699833
Course Type	Minor/Elective course		

COURSE OVERVIEW

This is a minor three credit course offered to B.Tech. students. Three theory classes will be conducted per week.

COURSE OBJECTIVES

Enabling the students to grasp the basics and advances in the area of coordination chemistry and to gain a clear picture on the principles and applications which underlie the subject.

COURSE OUTCOMES (CO)

The students will familiarize themselves in

- ✓ Learning about the basic concepts and theories of bonding in coordination chemistry.
- ✓ Understanding the spectroscopic and magnetic characteristics of metal complexes.
- ✓ Learning about the stability factors and reaction mechanisms of metal complexes.
- ✓ Having a thorough picture of the various biological important coordination compounds.
- ✓ Having an overview of the applications of coordination chemistry in biological and industrial processes.

COURSE TEACHING AND LEARNING ACTIVITIES			
S.No	**Week**	**Topic**	**Mode of Delivery**
1	I week of Jan 2018	**UNIT-I** **Basic concepts and theories of coordination compounds:** Introduction - Nomenclature of coordination compounds - Electronic theory of complex compounds - valence bond theory - Crystal field theory - assumptions of crystal field theory	C&T, PPT
2	II week of Jan 2018	Crystal field splitting in octahedral and tetrahedral geometries - CFSE, factors affecting the magnitude of 10 Dq, Jahn-Teller distortion - Merits and limitations of CFT	C&T, PPT
3	III week of Jan 2018	Molecular orbital theory of selected octahedral and tetrahedral complexes. Polynuclear complexes - non-ionic complexes - coordination polymers - isomerism.	C&T, PPT
4	IV week of Jan 2018	**UNIT-II** **Spectral and magnetic characteristics of metal complexes:** Absorption spectra of complexes - interpretation, term symbols and splitting of terms in free atoms, selection rules for electronic transitions	C&T, PPT
5	I week of Feb 2018	Orgel diagram, electronic spectra of d^x complexes, Charge transfer spectra, CT versus d-d transitions	C&T, PPT
6	II week of Feb 2018	Magnetic properties of metal complexes - determination of magnetic susceptibilities - magnetic criterion of bond type - orbital contribution to magnetic moment.	C&T, PPT
7	III week of Feb 2018	**UNIT-III** **Stability and reactions of metal complexes:** Thermodynamic stability and Kinetic stability of complexes - stability constants - Factors affecting the stability of coordination compounds	C&T, PPT
8	IV week of Feb 2018	Determination of stability constants. Labile and inert coordination compounds - Ligand substitution reactions (SN1, SN2 and SN1CB) - anation reaction	C&T, PPT
9	I week of Mar 2018	Electron transfer reaction - OSM - ISM. Substitution reactions in square planar complexes - trans effect - theories and applications of trans effect.	C&T, PPT
10	II week of Mar 2018	**UNIT-IV** **Biological coordination compounds:** Transport and storage of oxygen - hemoglobin and myoglobin- hemeythrin and hemocyanine - syntheticoxygen carriers	C&T, PPT
11	III week of Mar 2018	Electron transfer - Cytochromes, Rubredoxins and Ferredoxins. Catalysis - Catalase - blue copper proteins	C&T, PPT

12	IV week of Mar 2018	Metalloenzymes. Photosynthesis - chlorophyll - vitamin B_{12} and its biological functions.	C&T, PPT
13	I week of Apr 2018	**UNIT-V** **Applications of coordination chemistry:** Analytical chemistry: Inorganic qualitative analysis, complexometric titrations, complexes in colorimetry, gravimetry and separation of metals. Medicinal chemistry: complexation in food poisoning and metal complexes in therapy	C&T, PPT
14	II week of Apr 2018	Anticancer drugs, anti-arthritis drug of gold drugs and radiodiagnostic agents. Electrochemistry: Electro deposition of specific metals, Chromium, Copper, Nickel, Precious metal.	C&T, PPT
15	III week of Apr 2018	Dyes and pigments: Metal complexes of azo compounds - azomethines. Industrial processes: catalytic activation - hydrogenation, hydroformylation and oxidation of olefins.	C&T, PPT

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assignment/Quiz/Seminar	I week of February	Depends on the activity	5
2	Cycle Test - I	III week of February	1 h	20
3	Assignment/Quiz/Seminar	III week of March	Depends on the activity	5
4	Cycle Test - II	I week of April	1 h	20
5	End Semester	IV week of April	3 h	50

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

1. J. D. Lee, *Concise Inorganic Chemistry*, 5th Edition, Chapman and Hall, London, 1996.
2. G. O. Spessard and G. L. Miessler, *Organometallic Chemistry*, 2nd Edition, Oxford University Press.
3. F. A. Cotton, G. Wilkinson, C. A. Murillo and M. Bochmann; *Advanced Inorganic Chemistry*, 6th Edition. Wiley, 1999.
4. J. E. Huheey, E. A. Keiter and R. L. Keiter, *Inorganic Chemistry, Principles of Structure and Reactivity*, 4th Edition, Harper Collin College Publishers, 1993.
5. *Comprehensive Coordination Chemistry. The Synthesis, Reactions, Properties and Application of Coordination Compounds*, Volume 6, Sir Geoffrey Wilkinson, Robert D. Gillard, Jon A McCleverty, 1987 Pergamon Books Ltd. England.
6. S. J. Lippard and J. M. Berg, *Principles of Bioinorganic Chemistry*, Univ. Science Books, 1994.

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)
1. Feedback from students during class committee meetings. 2. Anonymous feedback through electronic media.
COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)
1. Tests I and II will be conducted in regular class. 2. Plagiarism is forbidden and will be dealt sternly. 3. 75% attendance is mandatory for writing the end semester examination. 4. A retest will be conducted for those who missed the CT - I or II or both for genuine reasons during the III week of April 2018, covering the syllabus of Tests I and II.
ADDITIONAL COURSE INFORMATION
The course faculty will be available for consultation at times as per the intimation by the faculty.
FOR SENATE'S CONSIDERATION
Course Faculty **CC-Chairperson** **HOD**