M.Sc. INORGANIC CHEMISTRY
SYLLABUS

FACULTY OF SCIENCE

DEPARTMENT OF CHEMISTRY

SATAVAHANA UNIVERSITY-KARIMNAGAR

UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

SU - M.Sc., (CHE) II SEMESTER

Paper Code	Title	Workload Per Week		Marks			Credits	Duration of the Exams.
		Theory	Practical	Internal	University	Total		
MCHE 201T	Inorganic Chemistry-II	4	--	20	80	100	4	3 Hrs
MCHE 202T	Organic Chemistry-II	4	--	20	80	100	4	3 Hrs
MCHE 203T	Physical Chemistry-II	4	--	20	80	100	4	3 Hrs
MCHE 204T	Analytical Techniques & Spectroscopy-II	4	--	20	80	100	4	3 Hrs
MCHE 205P	Inorganic Chemistry LAB-II	--	6	15	60	75	3	4 Hrs
MCHE 206P	Organic Chemistry LAB-II	--	6	15	60	75	3	4 Hrs
MCHE 207P	Physical Chemistry LAB-II	--	6	15	60	75	3	4 Hrs
MFC* 201T	Fundamentals on Computers & Office Automation	2	--	10	40	50	2	2 Hrs
TOTAL		18	18	135	540	675	27	

***Every student must pass this paper since it is mandatory. However the credits will not included in the calculation of SGPA and CGPA**

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SEMESTER –II

Paper-I

MCHE (IC) 201 T: INORGANIC CHEMISTRY-II

IC-05: Reaction mechanisms of transition metal complexes
IC-06: Bonding in metal complexes-II
IC-07: Metal clusters
IC-08: Bio-coordination chemistry

IC-05: Reaction mechanisms of transition metal complexes: (15Hrs)

Ligand substitution reactions: Energy profile of a reaction – Transition state or Activated Complex. Types of substitution reactions (SE,SN,SN^1,SN^2).

Ligand substitution reactions in octahedral complexes: Aquation or Acid hydrolysis reactions, Factors effecting Acid Hydrolysis , Base Hydrolysis, Conjugate Base Mechanism, Evidences in favour of SN^1CB Mechanism. Annation reactions.

Substitution reactions without Breaking Metal-Ligand bond. Anation reaction, Acid catalyze aquation reaction.

Ligand Substitution reactions in Square-Planar complexes: Mechanism of Substitution in Square-Planar complexes- Trans-effect, Grienberg's Polarization theory and π - bonding theory – Applications of Trans-effect in synthesis of Pt (II) complexes.

Electron Transfer Reactions (or Oxidation-Reduction Reactions) in Coordination compounds: Mechanism of One-electron Transfer Reactions: Atom (or group) Transfer or Inner Sphere Mechanism, Direct electron Transfer or Outer Sphere Mechanism. Marcus –Hush theory. Factors effecting direct electron transfer reactions.

IC-06: Bonding in Metal Complexes – II: (15Hrs)

Free ion terms and Energy levels: Configurations, Terms, States and Microstates – Formula for the calculation of Microstates p^n and d^n configurations – L-S (Russel-Saunders) coupling scheme – j-j coupling scheme – Determination of terms for various p^n and d^n configurations of metal ins. Hole formalism – Energy ordering of terms (Hund's rules) Inter – electron repulsion Parameters (Racah parameters) – Spin-Orbital coupling parameters. Effect of weak cubic crystal fields on S,P,D and F terms- Orgel Diagrams. Jahn –Tellor theorem and its effects on terms. Molecular term symbols.

IC-07: Metal Clusters: (15Hrs)

Carbonyl clusters: Factors favoring Metal-Metal bonding – Classification of Clusters – Low Nuclearity Clusters : M_3 and M_4 clusters , structural patterns in $M_3(CO)_{12}$ (M=Fe,Ru,Os) and $M_4(CO)_{12}$ (M=Co, Rh, Ir) Clusters-. Metal carbonyl scrambling – High Nuclearity clusters M_5,M_6,M_7,M_8 and M_{10} Clusters-, Polyhedral skeletal electron pair theory and Total Electron Count theory – Wades rules – Capping rule – Structural patterns in $[Os_6(CO)_{18}]^{2-}$, $[Rh_6(CO)_{16}]$, $[Os_7(CO)_{21}]$, $[Rh_7(CO)_{16}]^{3-}$, $[Os_8(CO)_{22}]^{2-}$, $[Os_{10}C(CO)_{24}]^{2-}$ and $[Ni_5(CO)_{12}]^{2-}$.

Metal Halide clusters: Major structural types in Dinuclear Metal-Metal systems – Edge sharing Bioctahedra, Face sharing Bioctahedra, Tetragonal prismatic and Trigonal antiprismatic structures -. Structure and bonding in $[Re_2Cl_8]^{2-}$ and Octahedral halides of

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$[Mo_6(Cl)_8]^{4+}$ and $[Nb_6(Cl)_{12}]^{2+}$. Trinuclear halides of Re(III).Hoffman's Isolobal analogy and its Structural implications. Boranes, carboranes, STYX Rule.

IC-08: Bio Coordination Chemistry: (15Hrs)

Metal ions in Biological systems: Brief survey of metal ions in biological systems. Effect of metal ion concentration and its physiological effects. Basic principles in the biological selection of elements.

Oxygen transport and storage: Hemoglobin and Myoglobin: Geometric, electronic and magnetic aspects of Dioxygen binding, Oxygen adsorption isotherms and cooperativity in Hemoglobin and its physiological significance. Role of globin chain. Hemerythrin and Hemocyanin: Structure of deoxy forms, oxygen binding, Geometric, electronic and magnetic aspects. Comparison of Hemerythrin and Hemocyanin with hemoglobin.Transport of NO and CO_2

Photosynthesis: Structural aspects of Chlorophyll. Photo system I and Photo system II.

Vitamin B_6 model systems: Forms of vitamin B_6 with structures. Reaction mechanisms of (1) Transamination (2) Decarboxylation and (3) Dealdolation in presence of metal ions.

SUGGESTED BOOKS

1. Inorganic Reaction Mechanisms. M.L.Tobe and John Burgess, Addison Wesley Longman (1999).
2. Metal ions in Reaction Mechanisms. K.Veera Reddy. Golgotia Publications (P) Ltd
3. Mechanisms of Reactions in Transition Metal Sites. Richard A Henderson, Oxford Science Publications, London (1993).
4. Inorganic Reaction Mechanisms, F.Basolo and R.G.Pearson, New York (1967).
5. Advanced Inorganic Chemistry. F.A.Cotton, G.Wilkinson, C.A.Murillo and M.Bochmann, 6 Th Edition, Wiley Interscience, N.Y (1999
6. Inorganic Chemistry, J.E.Huheey , K.A.Keiter and R.L.Keiter 4 th Edition Harper Cottens College Publications (1993).
7. Inorganic Biochemistry Edited by G.L.Eichorn, Volume 1 Elsevier (1982).
8. The Chemistry of Metal Cluster Complexes. D.F.Shriver, H.D.Kaerz and R.D.Adams (Eds), VCH, NY (1990).
9. Inorganic Chemistry, Keith F.Purcell and John C.Kotz, Holt-Saunders International Editions, London (1977).
10. Bioinorganic Chemistry, I.Bertini, H.B.Gray, S.J.Lippard and S.J.Valentine, Viva Low-Priced Student Edition, New Delhi (1998).
11. Bioinorganic Chemistry: Inorganic Elements in the Chemistry of Life, W.Kain and B.Schwederski, John Wiley and Sons, NY (1999).
12. Bioorganic Chemistry – Dugas.

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LABORATORY COURSE – II SEMESTER

MCHE 205 P : Inorganic Chemistry Practicals **Time: 6 hrs/week**
Marks:75

Estimation

a) Calcium in Milk

Analysis of Component Mixtures

a) Determination of Cu^{+2} and Ni^{+2}

b) Determination of Ferry and Ferro

c) Separation of Ni^{+2} and Cu^{+2} from Mg^{+2} in the given mixture and estimation of Mg^{+2} Gravimetry

Applied Titrimetric Analysis

a) Determination of Iron in Cement

b) Determination of Calcium in Cement

c) Determination of Calcium in Calcium Tablets

Solvent Extraction Method

a) Determination of Pb as Pb-Dithiazone Complex

Ion Exchange Methods of Analysis

a) Determination of Capacity of an Ion Exchange Resin

b) Separation of Zinc and Magnesium on an Anion Exchange Resin and Estimation of Mg^{+2} and Zn^{+2}

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MODEL QUESTION PAPER

1Q. Separate Ni^{+2} and Cu^{+2} in given ternary mixture solution and estimate the amount of Mg^{+2} gravimetrically

2Q. Estimate the amount of Iron present in cement

SCHEME OF EVALUATION

Max marks: 75

I. External Assessment	**Marks: 60**
Estimation	20
Analysis of Binary mixture	30
Viva-voce	10
II. Internal Assessment	**15**
Day to day work & regularity	10
Record	05

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