

**Shyam Lal College**

Teaching Plan (August 2024, odd Semester)  
B.Sc. II<sup>nd</sup> Year (Hons.), Semester III

By  
**Dr. Ompal Singh Yadav**

<b>Week days</b>	<b>Topics to be covered</b>
Week -01	General group trends with special reference to electronic configuration, colour
Week-02	Variable valence , magnetic properties
Week-03	Catalytic properties and ability to form complexes.
Week-04	Stability of various oxidation states
Week-05	E.M.F. ( Latimer diagram), Frost diagrams of Mn and Cr.
Week-06	A brief discussion of difference between the first second and third transition series
Week-07	A brief discussion of electronic configuration, oxidation states, colour of Lanthanide
Week-08	Colour, spectral and magnetic properties and Lanthanide contraction (causes and effects)
Week-09	Separation of lanthanoids by ion exchange method.
Week-10	Comparison with organic polymers, classification, structure and applications of following inorganic polymers: ● Borates
Week-11	Comparison with organic polymers, classification, structure and applications of following inorganic polymers: ● Silicates
Week-12	Comparison with organic polymers, classification, structure and applications of following inorganic polymers:

	<ul style="list-style-type: none"> <li>● Silicones</li> </ul>
Week-13	Semester Break
Week-14	<p>Comparison with organic polymers, classification, structure and applications of following inorganic polymers:</p> <ul style="list-style-type: none"> <li>● Phosphates</li> </ul>
Week-15	<p>Comparison with organic polymers, classification, structure and applications of following inorganic polymers:</p> <ul style="list-style-type: none"> <li>● Phosphazenes (for cyclic polymers, only trimer is to be discussed)</li> </ul>
Week-16	Particle size, Precipitation, Coagulation, Peptization, Co-precipitation, Digestion, Filtration and washing the precipitate,
Week-17	Drying and ignition the precipitate and Remedial Class

**DEPARTMENT OF CHEMISTRY**  
**Category-I**  
**B Sc. (Hons) Chemistry**

**DISCIPLINE SPECIFIC CORE COURSE -7 (DSC-7): Chemistry of d- and f-block Elements & Quantitative Inorganic Analysis**

**CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE**

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Chemistry of d- and f-Elements & quantitative Inorganic Analysis (DSC-7)	04	02	0	02	Passed Class 12 <sup>th</sup> with Physics, Chemistry, Mathematics	NIL

**Learning Objectives**

The Objectives of this course are as follows:

- To provide thorough knowledge about the d- and f- block elements with respect to the general group trends, physical and chemical properties of these elements.
- To familiarize the students with the d- and f-block elements and get an idea about horizontal similarity in a period in addition to vertical similarity in a group.
- To impart the knowledge about inorganic polymer
- To give an idea about the principles of gravimetric analysis.

**Learning outcomes**

By studying this course, the students will be able to:

- List the important properties of transition metals, lanthanoids, and actinoids
- Use Latimer diagrams to predict and identify species which are reducing, oxidizing and tend to disproportionate and calculate skip step potentials.
- Describe the classification, structure and applications of Inorganic Polymers.
- List and use the principles of gravimetric analysis for quantitative analysis

**SYLLABUS OF DSC-7**

**UNIT – 1: Transition Elements**

**(12 Hours)**

General group trends with special reference to electronic configuration, colour, variable valency, magnetic properties, catalytic properties, and ability to form complexes. Stability of various oxidation states and e.m.f. (Latimer diagrams), Frost diagrams of Mn and Cr.

A brief discussion of differences between the first, second and third transition series

#### **UNIT – 2: Lanthanoids and Actinoids (8 Hours)**

A brief discussion of electronic configuration, oxidation states, colour, spectral and magnetic properties. Lanthanoid contraction (causes and effects) separation of lanthanoids by ion exchange method.

#### **UNIT – 3: Inorganic Polymer (8 Hours)**

Comparison with organic polymers, classification, structure and applications of following inorganic polymers:

- Borates
- Silicates, silicones
- Phosphates
- Phosphazenes (for cyclic polymers, only trimer is to be discussed)

#### **UNIT – 4: Principles of gravimetric analysis (2 Hours)**

Particle size, Precipitation, Coagulation, Peptization, Co-precipitation, Digestion, Filtration and washing the precipitate, Drying and ignition the precipitate

#### **Practical component (60 Hours)**

**(Laboratory periods:15 classes of 4 hours each)**

##### **(A) Gravimetry**

1. Estimation of Ni(II) using dimethylglyoxime (DMG).
2. Estimation of copper as CuSCN.
3. Estimation of iron as Fe<sub>2</sub>O<sub>3</sub> by precipitating iron as Fe(OH)<sub>3</sub>. (by homogeneous and heterogeneous method)
4. Estimation of Al(III) by precipitating with oxime and weighing as Al(oxime)<sub>3</sub> (aluminiumoxinate).

##### **(B) Inorganic Preparations**

1. Potassium aluminium sulphate KAl(SO<sub>4</sub>)<sub>2</sub>·12H<sub>2</sub>O (potash alum) or Potassium chromium sulphate KCr(SO<sub>4</sub>)<sub>2</sub>·12H<sub>2</sub>O (chrome alum).
2. Manganese phosphate and
3. Sodium peroxoborate

##### **(C) Paper chromatographic separation of following metal ions (minimum two should be done):**

1. Ni(II) and Co(II)