

**FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)**  
**DEPARTMENT OF CHEMISTRY**  
**COURSE CURRICULUM**

PART-A: Introduction				
Program: Bachelor in Science (Degree/Honors)		Semester -V		Session: 2024-2025
1	Course Code	CHSC-05T		
2	Course Title	ORGANIC AND INORGANIC CHEMISTRY - I		
3	Course Type	DSC		
4	Pre-requisite(if,any)	As per Program		
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"><li>➤ Explore role of nitrogen in organic chemistry by studying N-containing compounds and heterocycles.</li><li>➤ Unravel molecular structures using techniques like rotational, vibrational, and Raman spectroscopy.</li><li>➤ Demystify bonding in transition metal complexes, including stability, lability, and magnetic properties.</li><li>➤ Understand the importance of organometallic and inorganic compounds in biological systems.</li></ul>		
6	Credit Value	3 Credits	Credit = 15 Hours -learning & Observation	
7	Total Marks	Max. Marks: 100	Min Passing Marks:40	
PART -B: Content of the Course				
Total No. of Teaching-learning Periods(01 Hr. per period) - 45 Periods (45 Hours)				
Unit	Topics(Course contents)			No. of Periods
I	(A)Organic Compound of Nitrogen Preparation of Nitroalkanes and Nitroarenes, Chemical properties of nitroalkanes, Mechanism of nucleophilic substitutions in nitroarenes, Reduction of nitroalkane in acidic, neutral, and alkaline medium. Picric acid Amines:- Nomenclature, Structure and stereochemistry. Basicity, Structural feature effecting basicity of amines. separation of primary, secondary and tertiary amines. Amine salt as phase transfer catalyst. Preparation of alkyl and aryl amines:- reduction of nitro compound, reductive amination of aldehydic and ketonic compounds. Gabriel Phthalimide reaction, Hoffmann Bromamide reaction. Physical and chemical properties of amine: electrophilic aromatic substitution in aryl amines, reaction of amines with nitrous acid, synthetic transformation of aryl diazonium salts, Azo-coupling reaction.			12
II	Spectroscopy: General introduction, electromagnetic radiation, region of spectrum, representation of spectral width and intensity of spectral transition. (A)Rotational spectra of diatomic molecule as rigid rotor, selection rule, energy level, transition, spectra. Determination of bond length, Isotope effect, Qualitative description of non-rigid rotor. (B)Vibrational Spectra: Fundamental vibrational bands and their symmetry. Diatomic molecule as harmonic oscillator. Selection rule, pure vibrational spectrum, Determination of force constant Anharmonic oscillator. (C)Raman Spectra: introduction, concept of polarization, quantum theory, stoke and antistoke line, pure rotational and vibrational Raman spectra. Applications of Raman spectra.			11
III	(A)Metal Ligand Bonding in Transition Metal Complex: postulate of CFT. Splitting of d orbitals in octahedral, tetrahedral complex, Spectro-chemical series, Calculation of CFSE, Factors affecting CFSE, Applications of CFSE, Jahn-Teller Distortion, Limitations of CFT. (B) Thermodynamic and Kinetic aspects of Metal Complexes: A brief introduction of			11



	thermodynamic and kinetic stability of complex, Stepwise and overall stability constant. (C) Magnetic properties: Types of magnetic behavior, Methods of determining magnetic susceptibility, Spin Only formula, L-S Coupling, Calculation of effective magnetic moment, Orbital contribution to magnetic moment.	
IV	(A) <b>Organometallic Chemistry:</b> Definition, nomenclature, and Classification of organometallic compounds. Preparation, properties, bonding and application of alkyls and aryls of Li, Al. A brief account of metal ethylenic metal complexes special reference to Zeise's salt. Mononuclear carbonyls and nature of bonding in metal carbonyls. 18 electron rules (Effective Atomic Number Rule). Ziegler-Natta Catalyst for polymerization of alkene, Wilkinson Catalyst and Hydrogenation, Hydroformylation. (B) <b>Bioinorganic Chemistry:</b> Essentials and trace elements in biological system, metalloporphyrins, with special reference to hemoglobin and myoglobin. Biological role of alkali and alkaline earth metals with special reference to $\text{Na}^+$ $\text{K}^+$ $\text{Ca}^{2+}$ and $\text{Mg}^{+2}$ , Nitrogen fixation.	11
Keywords	Amines, Nitro compounds, Zeigler-Nata Catalyst, Wilkinson Catalyst, rigid rotor, harmonic oscillator, Hemoglobin, myoglobin.	

Signature of Convener & Members:

### PART-C: Learning Resources

#### Text Books, Reference Books and Others

##### Text Books Recommended:

1. Bahl, A., & Bahl, B. S. (2020). *Organic chemistry (5th ed.)*. S. Chand & Company.
2. Madan, R. D. (2018). *Advanced organic chemistry*. S. Chand & Company.
3. Soni, P. L. (2019). *A textbook of organic chemistry*. S. Chand & Company.
4. Sharma, B. K. (2015). *Spectroscopy*. GOEL Publishing House.
5. Kaur, H. (2018). *Spectroscopy*. Pragati Prakashan.
6. Das, A. K. (2012). *Bioinorganic Chemistry*. Publisher.

##### Reference Books Recommended:

1. Skoog, D. A., Holler, F. J., & Crouch, S. R. (2017). *Principles of Instrumental Analysis*. Cengage Learning.
2. Mehrotra, R. C. (2010). *Organometallic Chemistry*. New Age International.
3. Carlbtree, R. H. (2014). *Organometallic Chemistry of the Transition Metal*. University Science Books.
4. Housecroft, C. E., & Sharpe, A. G. (2012). *Inorganic Chemistry*. Pearson.
5. Miessler, G. L., Fischer, P. J., & Tarr, D. A. (2010). *Inorganic Chemistry*. Pearson.

##### Online Resource:

- e-Resources / e-books and e-learning portals
- [https://onlinecourses.nptel.ac.in/noc23\\_cy01/preview](https://onlinecourses.nptel.ac.in/noc23_cy01/preview)
- <https://pubs.rsc.org/en/content/articlelanding/1978/f2/f29787401203>
- [https://onlinecourses.swayam2.ac.in/cec23\\_cy03/preview](https://onlinecourses.swayam2.ac.in/cec23_cy03/preview)
- [https://onlinecourses.nptel.ac.in/noc22\\_cy12/preview](https://onlinecourses.nptel.ac.in/noc22_cy12/preview)

### PART-D: Assessment and Evaluation

#### Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment(CIA): 30 Marks

End Semester Exam(ESE): 70 Marks

Continuous Internal Assessment(CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 / 20 Assignment/Seminar- 10 Total Marks -30	Better marks out of the two Test / Quiz+ obtained marks in Assignment shall be considered against 30 Marks
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40Marks	

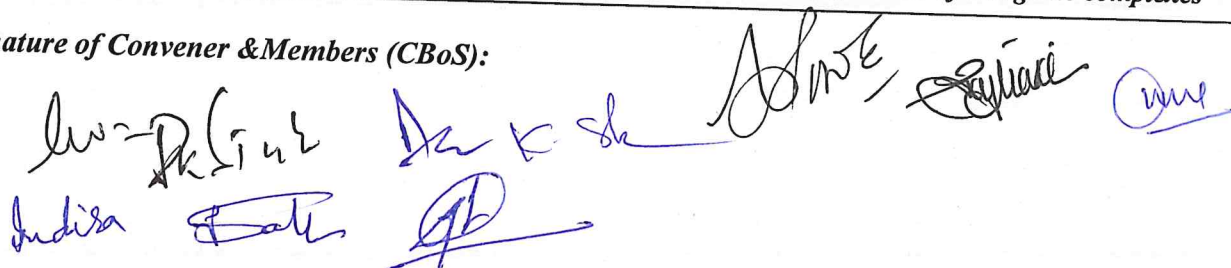
Name and Signature of Convener & Members of CBoS:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)

**DEPARTMENT OF CHEMISTRY**  
**COURSE CURRICULUM**

PART-A: Introduction				
Program:Bachelor in Science (Degree/Honors)			Semester -V	Session: 2024-2025
1	CourseCode	CHSC-05P		
2	CourseTitle	CHEMISTRY LAB COURSE -V		
3	CourseType	DSC		
4	Pre-requisite(if,any)	As per Program		
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"><li>➤ To apply the knowledge of qualitative and quantitative estimations in real sample analysis.</li><li>➤ To get 'Hands on Training' and develop skill for synthesis of various inorganic compounds.</li><li>➤ To learn the concept of gravimetric estimation.</li><li>➤ To learn use of conductometer and spectrophotometer for titration.</li></ul>		
6	CreditValue	1 Credits	Credit =30 Hours Laboratory or Field learning/Training	
7	Total Marks	Max.Marks:50		Min Passing Marks:20
PART -B: Content oftheCourse				
TotalNo.of learning-Training/performancePeriods:30 Periods (30 Hours)				
Module	Topics(Coursecontents)			No.ofPe riod
Lab./Field Training/ Experiment Contents of Course	1)To verify Beer-Lambert Law for KMnO <sub>4</sub> / K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> and determine the concentration of the given solution of the substrate from absorbance measurement. 2)To Determine the strength of the given acid conductometrically using standard alkali solution. 3)Gravimetric estimation of Ba as BaSO <sub>4</sub> from given solution of BaCl <sub>2</sub> . 4)Inorganic compound synthesis: (i) Synthesis of sodium trioxalato ferrate(III) Na <sub>2</sub> [Fe(C <sub>2</sub> O <sub>4</sub> ) <sub>3</sub> ] and determination of its composition by permanganometry. (ii) Synthesis of Ni-dimethylglyoxime complex [Ni(dmg) <sub>2</sub> ] (iii) Synthesis of Tetraaminecopper(II) sulphate [Cu(NH <sub>3</sub> ) <sub>4</sub> ]SO <sub>4</sub> (iv) Synthesis of Cis- and Trans-bisoxalatochromate(III)ion.			30
Keywords	Spectrophotometer, Lambert beers law, Gravimetric estimation, synthesis of inorganic complexes			

Signature of Convener & Members (CBoS):





## PART-C: Learning Resources

### Text Books, Reference Books and Others

#### Text Books:

1. Chatwal, G. R., & Sharma, A. (n.d.). *Instrumental methods of chemical analysis*. Himalaya Publishing House.
2. Raj, G. (2009). *Advanced Practical Inorganic Chemistry*. Krishna Prakashan.

#### Reference Books:

1. Svehla, G. (Ed.). (1978). *A textbook of quantitative inorganic analysis* (by A. I. Vogel). ELBS Publishers and Distributors. (Original work published 1968)
2. Henderson, W. A. (n.d.). *Inorganic synthesis*. Benjamin-Cummings Publishing Company.
3. Fernelius, W. G. (2009). *Experimental inorganic chemistry* (Adapted by R. K. Sharma & G. Panda). New Age International Publishers. (Original work published 1972)
4. Mendham, J., Denney, R. C., Barnes, J. D., & Thomas, M. (Eds.). (2000). *Vogel's textbook of quantitative chemical analysis* (6th ed.). Pearson Education India. (Original work by A. I. Vogel)
5. Furniss, B. S., Hannaford, A. J., Smith, P. W. G., & Tatchell, A. R. (Eds.). (1989). *Vogel's textbook of practical organic chemistry* (5th ed.). Longman Scientific & Technical. (Original work by A. I. Vogel)

#### Online Resources:

- e-Resources / e-books and e-learning portals
- <https://www.youtube.com/watch?v=s7pXbV9dumI>
- <https://onlinelibrary.wiley.com/series/2146>
- [https://chem.libretexts.org/Ancillary\\_Materials/Laboratory\\_Experiments/Wet\\_Lab\\_Experiments/General\\_Chemistry\\_Labs/Online\\_Chemistry\\_Lab\\_Manual/Chem\\_11\\_Experiments/07%3A\\_Gravimetric\\_Analysis\\_\(Experiment\)](https://chem.libretexts.org/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/General_Chemistry_Labs/Online_Chemistry_Lab_Manual/Chem_11_Experiments/07%3A_Gravimetric_Analysis_(Experiment))
- <https://mas-iiith.vlabs.ac.in/exp/beer-lambert-law/>

## PART-D: Assessment and Evaluation

### Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment(CIA):15 Marks

End Semester Exam(ESE):35Marks

<b>Continuous Internal Assessment(CIA):</b> (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar +Attendance- 05 Total Marks -15	Better marks out of the two Test / Quiz +obtained marks in Assignment shall be considered against 15 Marks
<b>End Semester Exam (ESE):</b>	<b>Laboratory / Field Skill Performance: On spot Assessment</b> M. Performed the Task based on lab. work - 20 Marks N. Spotting based on tools & technology (written) - 10 Marks O. Viva-voce (based on principle/technology) - 05 Marks	<b>Managed by</b> Course teacher as per lab. status

Name and Signature of Convener & Members of CBoS:

