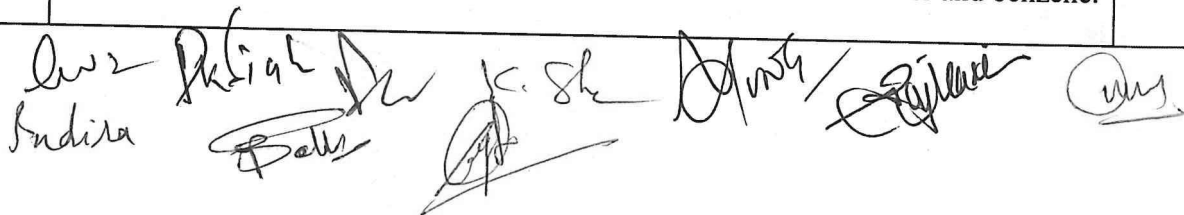


FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)
DEPARTMENT OF CHEMISTRY
COURSE CURRICULUM

PART-A: Introduction			
Program: Bachelor in Science <i>(Diploma / Degree/Honors)</i>		Semester - IV	Session: 2024-2025
1	Course Code	CHSC-04P	
2	Course Title	CHEMISTRY LAB. COURSE-IV	
3	Course Type	DSC	
4	Pre-requisite(if, any)	<i>As per Program</i>	
5	Course Learning Outcomes(CLO)	<ul style="list-style-type: none"> ➤ <i>Understand the fundamentals of organic compounds analysis including preparation of sodium extract and detection of elements.</i> ➤ <i>Identify functional groups and prepare derivatives.</i> ➤ <i>Determine the pH of various samples like water/acid/base/soil etc.</i> ➤ <i>Apply the concepts of phase equilibria to determine critical solution temperature and study concepts of Nernst distribution law and determine equilibrium constant of various reactions.</i> 	
6	Credit Value	1 Credits	<i>Credit =30 Hours Laboratory or Field learning/Training</i>
7	Total Marks	Max.Marks:50	Min Passing Marks:20
PART -B: Content of the Course			
Total No. of learning-Training/performancePeriods:30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Periods
Lab./Field Training/ Experiment Contents of Course	Organic Analysis <i>Systematic identification of organic compounds:</i> a. Test for aliphatic and aromatic nature of substances. b. Test for saturation and unsaturation. c. Detection of elements (N, S, and halogens) in organic compounds. d. Identification of functional groups: i) Carboxylic acids ii) Phenols iii) Aldehydes iv) Ketones, v) Esters vi) Carbohydrates vii) Amines viii) Amides, ix) Halogen compounds e. Determination of melting and boiling points. f. Preparation of solid derivatives. pH determination Determination of pH of soil, water. To measure the pH of various solutions using pH indicators and pH meter. To determine the value of Ka for an unknown acid. To prepare and study the properties of buffer solutions. Phase Equilibrium: 1) To determine the critical solution temperature of two partially miscible liquids (phenol-water systems). 2) To study the effect of solute such as (i) sodium chloride (NaCl), (ii) succinic acid (HOOC-CH ₂ -CH ₂ -COOH) on the critical solution temperature of two partially miscible liquids (e.g. phenol – water system). 3) To construct the phase diagram of two components (e. g. diphenylamine-benzophenone system) by cooling curve method. Nernst Distribution Law 1) To determine the partition coefficient of Iodine between water and carbon tetrachloride/Kerosene. 2) To determine the partition coefficient of benzoic acid between water and benzene.		30



	3) To determine the equilibrium constant of the reaction, $KI + I_2 = KI_3$ by distribution method.
Keywords	Organic analysis, Aromatic/Aliphatic compounds, Saturated/unsaturated compounds, Element detection, Functional groups, Derivatives for functional groups, pH, Phase equilibria, Nernst distribution law.

Signature of Convener & Members (CBoS) :

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. Sahu, D. P. & Bapat, K. N. (2022) *Unified Practical Chemistry*, Navbodh Prakashan.
2. Yadav, J. B. (2006). *Advanced Practical Physical Chemistry*. Krishna Prakashan Media.
3. Pandey, O. P., Bajpai, D. N., Giri, S. (2010). *Practical Chemistry*. S. Chand Publisher.

Reference Books Recommended:

1. Moudgil, H. K. (2010). *Textbook of Physical Chemistry*. PHI Learning Pvt. Ltd.
2. Adamson, A. (2012). *A Textbook Of Physical Chemistry*. Elsevier.
3. Findlay, A. (1923). *Practical Physical Chemistry*. Longmans, Green.
4. Leonard, J, Lygo, B & Procter, G. (2013). *Advanced Organic Practical Chemistry*, CRC Press.

Online Resources–

- e-Resources / e-books and e-learning portals
- [https://faculty.ksu.edu.sa/sites/default/files/vogel - practical organic chemistry 5th edition.pdf](https://faculty.ksu.edu.sa/sites/default/files/vogel_practical_organic_chemistry_5th_edition.pdf)
- <https://tech.chemistrydocs.com/Books/Physical/Advanced-Physical-Chemistry-Experiments-by-J-N-Gurtu-&-Amit-Gurtu.pdf>
- <https://byjus.com/chemistry/conductometric-titration/>
- [https://chem.libretexts.org/Courses/University of California Davis/Chem 4B Lab%3A General Chemistry for Majors II/1%3A Thermochemistry \(Experiment\)](https://chem.libretexts.org/Courses/University_of_California_Davis/Chem_4B_Lab%3A_General_Chemistry_for_Majors_II/1%3A_Thermochemistry_(Experiment))
- https://www.ulm.edu/chemistry/courses/manuals/chem1010/experiment_10.pdf
- <https://www.masterjeeclases.com/wp-content/uploads/2019/02/11.Practical-Organic-ChemistryTheory.pdf>

Online Resources–

- e-Resources / e-books and e-learning portals

PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment(CIA): 15 Marks

End Semester Exam(ESE): 35 Marks

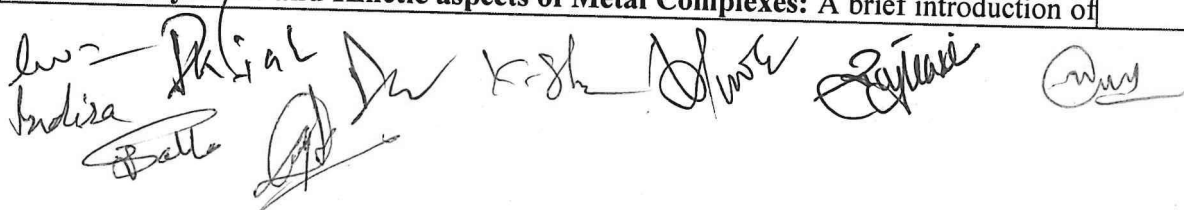
Continuous Internal Assessment(CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 10 10	Better marks out of the two Test / Quiz +obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance - 05 Total Marks - 15	
End Semester Exam (ESE):	Laboratory / Field Skill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

Name and Signature of Convener & Members of CBoS:

Indira Prakashan Dr. K. S. Anil K. Jyoti

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"> ➤ Explore role of nitrogen in organic chemistry by studying N-containing compounds and heterocycles. ➤ Unravel molecular structures using techniques like rotational, vibrational, and Raman spectroscopy. ➤ Demystify bonding in transition metal complexes, including stability, lability, and magnetic properties. ➤ Understand the importance of organometallic and inorganic compounds in biological systems. 	
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) Organometallic Chemistry: 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 Zeisse's salt. Mononuclear carbonyls and nature of bonding in metal carbonyls. 18 electron rules (Effective Atomic Number Rule). Ziegler-Nata Catalyst for polymerization of alkene, Wilkinson Catalyst and Hydrogenation, Hydroformylation. (B) Bioinorganic Chemistry: 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 Na ⁺ K ⁺ Ca ²⁺ and 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. Carbtree, 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://pubs.rsc.org/en/content/articlelanding/1978/f2/f29787401203>
- > https://onlinecourses.swayam2.ac.in/cec23_cy03/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	Better marks out of the two Test / Quiz+ obtained marks in Assignment shall be considered against 30 Marks
	Assignment/Seminar- 10 Total Marks -30	
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., 1 out of 2 from each unit-4x10=40Marks	

Name and Signature of Convener & Members of CBoS:

FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)