

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

<b>PART- A: Introduction</b>			
Program: Bachelor in Science (Diploma / Degree/Honors)		Semester - IV	Session: 2024-2025
1	Course Code	ICSC-04T	
2	Course Title	UNIT PROCESSES, INSTRUMENTATION, AND INDUSTRIAL SAFETY	
3	Course Type	DSC	
4	Pre-requisite (if, any)	As per Program	
5	Course Learning Outcomes (CLO)	<ul style="list-style-type: none"> <li>➤ To gain knowledge about hydrogenation reactions, catalysts for hydrogenation, alkylation, alkylating agents, manufacture, and mechanism of organic compounds</li> <li>➤ To understand aminolysis, aminating agents, amination reaction and their mechanism.</li> <li>➤ To understand the concept of construction, principle and working of temperature and pressure measuring instruments.</li> <li>➤ To know about liquid level measurement, density, viscosity filters, precipitators, eliminators, scrubbers, absorbers, and industrial safety measures.</li> </ul>	
6	Credit Value	3 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
<b>PART -B: Content of the Course</b>			
Total No. of Teaching-learning Periods (01 Hr. per period) - 45 Periods (45 Hours)			
Unit	Topics (Course contents)		No. of Period
I	<b>Hydrogenation:</b> Introduction, mechanism of hydrogenation reactions, catalysts for hydrogenation reactions, hydrogenation of vegetable oil. Manufacture of methanol from carbon monoxide and hydrogen, hydrogenation of acid and esters to alcohols, catalytic reforming. <b>Alkylation:</b> Introduction; Types of alkylation, alkylating agents. Mechanism of alkylation reactions, manufacture of alkyl benzene (for detergent manufacture), ethyl benzene, phenyl ethyl alcohol, N-alkyl anilines (mono and di methylanilines).		12
II	<b>Esterification:</b> Introduction, hydrodynamics and mechanism of esterification reactions, Esterification by organic acids, by addition of unsaturated compounds, esterification of carboxy acid derivatives, commercial manufacture of ethyl acetate, dioctyl phthalate, vinyl acetate, cellulose acetate. <b>Hydrolysis:</b> Introduction, hydrolyzing agents, mechanism of hydrolysis.		11
III	<b>Amination</b> <b>By reduction:</b> Introduction, methods of reduction - metal and acid, catalytic, sulfide, electrolytic, metal and alkali sulfites, metal hydrides, sodium metal, concentrated caustic oxidation, reduction, commercial manufacture of aniline, m-nitro aniline, p-aminophenol. <b>By aminolysis:</b> Introduction, aminating agents, factors affecting aminolysis.		11
IV	(A). Process Instrumentation:		11

	<p>Concept of measurement and accuracy, principle, construction and working of following measuring instruments.</p> <p><b>Temperature:</b> Glass thermometers, bimetallic thermometer, pressure spring thermometer, vapour filled thermometers, resistance thermometers, radiation pyrometers.</p> <p><b>Pressure:</b> Manometers, barometers, bourdon pressure gauge, bellow type, diaphragm type pressure gauges, Macleod gauges, Pirani gauges, etc.</p> <p><b>(B) Liquid level:</b> Direct-indirect liquid level measurement, Float type liquid level gauge, ultrasonic level gauges, bubbler system, density measurement, viscosity \ measurement.</p> <p>Bag filters, electrostatic precipitator, mist eliminators, wet scrubbers, absorbers, Industrial safety.</p>	
Keywords	Hydrogenation, alkylation, esterification, hydrolysis, amination, reduction, aminolysis, process instrumentation, temperature, pressure, liquid level.	

Signature of Convener & Members (CBoS) :

### PART-C: Learning Resources

Text Books, Reference Books and Others

#### Text Books Recommended –

1. B. K. (2017). *Industrial analysis*. Gael Publication.
2. Shali, A. K., & Parikh, D. V. (2008). *Introduction to industrial chemistry (5th ed.)*. Tata McGraw-Hill Education.
3. Mahajan, S. C., & Bhawalkar, V. D. (2010). *Engineering chemistry (2nd ed.)*. Wiley India Pvt. Limited.
4. Chakraborti, D., & Chakraborti, A. K. (2014). *Industrial chemistry (5th ed.)*. New Age International Publishers.

#### Reference Books Recommended-

1. Perry, J. H. (1950). *Chemical engineers' handbook (1st ed.)*. McGraw-Hill.
2. Dunn, W. C. (2005). *Fundamentals of industrial instrumentation and process control (1st ed.)*. McGraw-Hill.
3. Lipták, B. G. (Ed.). (2013). *Process control: Instrument engineers' handbook (1st ed.)*. Butterworth-Heinemann.
4. Groggins, P. H., & Groggins, P. H. (1958). *Unit processes in organic synthesis (1st ed.)*. McGraw-Hill

#### Online Resources–

- <https://archive.nptel.ac.in/courses/104/101/104101115/>
- <https://nptel.ac.in/courses/104103023>
- <https://uodiyala.edu.iq/uploads/PDF%20ELIBRARY%20UODIYALA/EL43/Introduction to InstrumentationSensors and Process Control.pdf>
- <https://ecampusontario.pressbooks.pub/powerplantsystemsandcontrols/chapter/instrument-devices-level-measurement-and-control-2/>
- <https://mrcet.com/downloads/digital notes/ME/IV%20year/MAINTENANCE%20&%20SAFETY%20ENGINEERING%20DIGITAL%20NOTES.pdf>

#### Online Resources–

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

### PART -D: Assessment and Evaluation

#### Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks


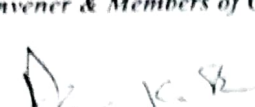


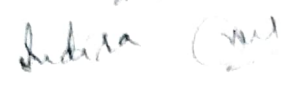





End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA):	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	



(By Course Teacher)		
End Semester Exam (ESE):	Two section – A & B Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10= 40 Marks	

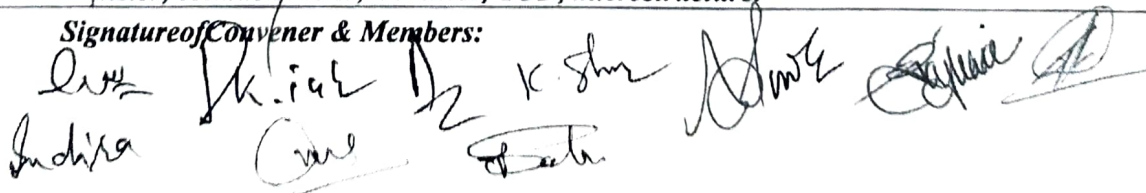
Name and Signature of Convener & Members of CBoS:

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

<b>PART-A: Introduction</b>			
<b>Program: Bachelor in Science</b> (Certificate/Diploma /Degree)		<b>Semester-IV</b>	<b>Session:2024-2025</b>
1	Course Code	ICSC-04P	
2	Course Title	INDUSTRIAL 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"> <li>➤ <i>To analyze the sample with different instruments.</i></li> <li>➤ <i>To develop understanding of material testing.</i></li> <li>➤ <i>To understand the working mechanism of instruments and different material characterization techniques.</i></li> <li>➤ <i>To analyze the quality of different water samples.</i></li> </ul>	
6	Credit Value	01Credit	<i>Credit =30 Hours Laboratory or Field learning/Training</i>
7	Total Marks	Max.Marks:50	MinPassingMarks:20
<b>PART-B: Content of the Course</b>			
<b>Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)</b>			
Module	Topics(Coursecontents)		No.of Period
<b>Lab./Field Training/ Experiment Contents of Course.</b>	<b>INSTRUMENTAL METHODS OF ANALYSIS:</b> Use of colorimeter, pH meter, Potentiometer, Conductometer, Refractometer, Polarimeter. <b>MATERIAL TESTING-I: -</b> Testing of alloys, Identification of plastics/rubber, estimation of yield point, Young's modulus, flaredness; Optical, Thermal, Mechanical and Electrical properties. <b>MATERIAL TESTING-II: -</b> Study of metallurgical microscope and sample preparation. Preparation and study of microstructure of cast Irons. Introduction to Nondestructive testing. <b>WATER ANALYSIS:</b> Solid contents, hardness, COD and other tests as per industrial specifications		<b>30 (30Hrs.)</b>
<b>Keywords</b>	<i>Instrumental methods, Analysis, material testing, water, Young's modulus, cast iron, pH meter, conductometer, hardness, COD, microstructure.</i>		

*Signature of Convener & Members:*


  
 Indira, K. Raj, K. Shree, Anurag, Rajan, Anurag

## PART-C

### Learning Resources: Text Books, Reference Books and Others

#### Text Books Recommended-

1. Sharma, B. K. (1981). Instrumental methods of chemical analysis. Krishna Prakashan Media.
2. Badwaik, H. R., Thote L.K.; Giri, T.K. (2022). Practical Handbook: Instrumental methods of analysis. Vallabh Prakashan. Delhi, India.

#### Reference Books Recommended-

1. Clesceri, L. S. (1998). Standard methods for examination of water and wastewater. American public health association, 9
2. Rump, H. H. (1999). Laboratory manual for the examination of water, waste water and soil (No. Ed. 3). Wiley-VCH Verlag GmbH.
3. Krautkrämer, J., & Krautkrämer, H. (2013). Ultrasonic testing of materials. Springer Science & Business Media.

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

- <https://mlrip.ac.in/wp-content/uploads/2022/03/INSTRUMENTAL-METHODS-OF-ANALYSIS-LAB-MANUAL.pdf>
- <https://byjus.com/chemistry/environmental-chemistry/>
- <https://ebooks.inflibnet.ac.in/espl6/chapter/water-pollution/#:~:text=The%20amount%20of%20dissolved%20oxygen,dissolved%20oxygen%20than%20saline%20water.>
- <https://law.resource.org/pub/in/bis/S11/is.13360.5.1.1996.pdf>
- <https://www.accessengineeringlibrary.com/content/book/9780070707047/chapter/chapter10>

## 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

<b>Continuous Internal Assessment (CIA):</b> (By Course Teacher)	Internal Test / Quiz-(2): <del>10</del> 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>Semester End Exam (SEE):</b>	<b>Laboratory / Field Skill Performance: On spot Assessment</b> G. Performed the Task based on lab. work - 20 Marks H. Spotting based on tools & technology (written) - 10 Marks I. Viva-voce (based on principle/technology) - 05 Marks	Managed by Course teacher as per lab. Status

Name and Signature of Convener & Members of CBoS:

