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

PART- A: Introduction				
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)**	➢ ***To gain knowledge about hydrogenation reactions, catalysts for hydrogenation, alkylation, alkylating agents, manufacture, and mechanism of organic compounds*** ➢ ***To understand aminolysis, aminating agents, amination reaction and their mechanism.*** ➢ ***To understand the concept of construction, principle and working of temperature and pressure measuring instruments.*** ➢ ***To know about liquid level measurement, density, viscosity filters, precipitators, eliminators, scrubbers, absorbers, and industrial safety measures.***		
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 Period
I	**Hydrogenation:** 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. **Alkylation:** 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	**Esterification:** 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. **Hydrolysis:** Introduction, hydrolyzing agents, mechanism of hydrolysis.	11
III	**Amination** **By reduction**: 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. **By aminolysis**: Introduction, aminating agents, factors affecting aminolysis.	11
IV	**(A). Process Instrumentation:**	11

	Concept of measurement and accuracy, principle, construction and working of following measuring instruments. **Temperature:** Glass thermometers, bimetallic thermometer, pressure spring thermometer, vapour filled thermometers, resistance thermometers, radiation pyrometers. **Pressure:** Manometers, barometers, bourdon pressure gauge, bellow type, diaphragm type pressure gauges, Macleod gauges, Pirani gauges, etc. **(B) Liquid level:** Direct-indirect liquid level measurement, Float type liquid level gauge, ultrasonic level gauges, bubbler system, density measurement, viscosity \ measurement. Bag filters, electrostatic precipitator, mist eliminators, wet scrubbers, absorbers, Industrial safety.	
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** Assignment / Seminar - **10** Total Marks - **30**	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against **30** Marks

(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

PART-A: Introduction				
Program: Bachelor in Science *(Certificate/Diploma /Degree)*			**Semester-IV**	Session:**2024-2025**
1	**Course Code**	**ICSC-04P**		
2	**Course Title**	**INDUSTRIAL CHEMISTRY LAB. COURSE-IV**		
3	**Course Type**	**DSC**		
4	**Pre-requisite (if,any)**	***As per Program***		
5	**Course Learning. Outcomes(CLO)**	➢ ***To analyze the sample with different instruments.*** ➢ ***To develop understanding of material testing.*** ➢ ***To understand the working mechanism of instruments and different material characterization techniques.*** ➢ ***To analyze the quality of different water samples.***		
6	**Credit Value**	**01Credit**	***Credit =30 Hours Laboratory or Field learning/Training***	
7	**Total Marks**	**Max.Marks:50**		**MinPassingMarks:20**

PART-B: Content of the Course

Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)

Module	**Topics(Coursecontents)**	**No.of Period**
Lab./Field Training/ Experiment Contents of Course.	**INSTRUMENTAL METHODS OF ANALYSIS:** Use of colorimeter, pH meter, Potentiometer, Conductometer, Refractometer, Polarimeter. **MATERIAL TESTING-I: -** Testing of alloys, Identification of plastics/rubber, estimation of yield point, Young's modulus, flaredness; Optical, Thermal, Mechanical and Electrical properties. **MATERIAL TESTING-II: -** Study of metallurgical microscope and sample preparation. Preparation and study of microstructure of cast Irons. Introduction to Nondestructive testing. **WATER ANALYSIS:** Solid contents, hardness, COD and other tests as per industrial specifications	**30 (30Hrs.)**
Keywords	***Instrumental methods, Analysis, material testing, water, Young's modulus, cast iron, pH meter, conductometer, hardness, COD, microstructure.***	

Signatureof Convener & Members:

PART–C

LearningResources:TextBooks,ReferenceBooksandOthers

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. VallabhPrakashan. Delhi, India.*

Reference Books Recommended–

1. *Clesceri, L. S. (1998). Standard methods for examination of water and wastewater. American publichealth 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.*

OnlineResources– e-Resources/e-booksande-learningportals

- 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/esp16/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:AssessmentandEvaluation

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** 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
Semester End Exam(SEE):	**Laboratory / Field Skill Performance: On spot Assessment** **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: