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

PART- A: Introduction				
Program: Bachelor in Science *(Honors/Honors with Research)*			**Semester - I**	Session: **2024-2025**
1	**Course Code**	**ICSC-01T**		
2	**Course Title**	**INDUSTRIAL TECHNOLOGY, METALLURGY AND SURFACE CHEMISTRY**		
3	**Course Type**	**DSC**		
4	**Pre-requisite** (if, any)	*As per program*		
5	**Course Learning. Outcomes (CLO)**	➢ *To explores the principles behind metal extraction and modification of crucial industrial materials.* ➢ *To gain expertise in unit operations like distillation, absorption, evaporation, filtration, and drying, essential for industrial chemical processes.* ➢ *To Analyze separation techniques and equipment selection* ➢ *To optimize industrial processes for efficient metal extraction and material production.*		
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	**Metallurgical Operations:** [A] Basic metallurgical operations: pulverization, calcination roasting and refining. [B] Physico-chemical principles of extraction of Lead, Silver, Aluminium, Magnesium, Zinc, Chromium **Ancient Indian Metallurgy:** General Introduction of Ancient Indian Chemical Techniques- Metallurgy, Dyes, Pigments, Cosmetics- their production and uses. Chemistry of Ancient Metals- Gold, Silver, Copper, Iron, Tin, Lead and Mercury- their extraction and uses.	**12**
II	**Inorganic materials of industrial importance:** Their availability, forms, structure and modification. Alumina, Silica, Silicates, Clays, Mica, Carbon, Zeolites.	**11**
III	**Chemical Technology - I** **[A] Distillation**-Introduction: Batch & continuous distillation, separation of azeotropes, plate columns and packed columns. **[B] Absorption** - Introduction, Equipments - Packed columns, spray columns, bubble columns, packed bubble columns, mechanically agitated contractors.	**11**
IV	**Chemical Technology - II** **[A] Evaporation**-Introduction, Equipments short tube (standard) evaporators, forced circulation evaporators, falling film evaporators, climbing film (Upward flow) evaporators. **[B] Filtration**- Introduction, filter media and filter aids, equipments – plate and frame, filter Press, notch filter, rotatory drum filter, sparkler filter, candle filter, bag filter, and centrifuge. **[C] Drying** – Introduction, free moisture, bound moisture, Equipments, tray dryer, flash dryer, fluid bed dryer, drum dryer, spray dryer.	**11**
Keywords	***Metallurgy, Ancient Indian Techniques, Extraction, Materials, Distillation, Separation, Processing***	

Signature of Convener & Members (CBoS) :

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended-

1. *Raghavan, V. (2018). Physical metallurgy: An introduction (5th ed.). Pitamber Publishing.*
2. *Chakravarty, A. K. (2010). Fundamentals of adsorption (2nd ed.). New Age International Publishers.*
3. *Narayanan, K. V., & Babu, B. C. (2017). Stoichiometry and process calculations (2nd ed.). PHI Learning Private Limited.*
4. *Gupta, O. P. (2006). Chemical process technology (Vol. 1 & 2). Khanna Publishers.*
5. *Verma, H. S. (1989). Principles of extractive metallurgy (Vol. 1 & 2). CBS Publishers & Distributors.*

Reference Books Recommended-

1. *Perry, R. H., Green, D. W., & Maloney, J. O. (2007). Perry's chemical engineers' handbook (8th ed.). McGraw-Hill Education.*
2. *Badger, W. L., & Banchero, J. J. (1965). Introduction to Chemical Engineering. McGraw-Hill.*
3. *Chattopadhyay, P. (2000). Unit Operations of Chemical Engineering (Vol. 1). Khanna Publishers.*
4. *Adamson, A. W. (1990). Physical chemistry of surfaces (6th ed.). John Wiley & Sons.*
5. *Dara, S. S. (2008). A Text Book of Engineering Chemistry. S Chand & Co Ltd.*

Text Books Recommended -

Online Resources–

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

- **https://www.scientificamerican.com/**
- **https://www.springer.com/journal/10853**
- **https://www.sciencedirect.com/journal/chemical-engineering-science**
- **https://www.niser.ac.in/**
- **https://www.tms.org/**

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): (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 =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 INDUSTRIAL CHEMISTRY
COURSE CURRICULUM

PART- A: Introduction				
Program: Bachelor in Science *(Certificate / Diploma / Degree/Honors)*			**Semester - I**	Session: **2024-2025**
1	**Course Code**	**ICSC-01P**		
2	**Course Title**	**INDUSTRIAL CHEMISTRY LAB. COURSE-I**		
3	**Course Type**	**DSC**		
4	**Pre-requisite** (if, any)	***As per program***		
5	**Course Learning. Outcomes (CLO)**	➢ ***Identify potential safety hazards in a chemistry laboratory.*** ➢ ***Become familiar with common laboratory safety procedures and protocols.*** ➢ ***Learn about the appropriate Personal Protective Equipment (PPE) for various situations.*** ➢ ***Understand the importance of safe handling and disposal of chemicals.***		
6	**Credit Value**	**1 Credits**	***Credit =30 Hours Laboratory or Field learning/Training***	
7	**Total Marks**	**Max. Marks: 50**	**Min Passing Marks: 20**	

PART -B: Content of the Course		
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)		
Module	**Topics (Course contents)**	**No. of Period**
Lab./Field Training/ Experiment Contents of Course	**Introduction to laboratory safety rules and regulations.** Identification of common hazards in the lab, including:Flammable liquids, Corrosive chemicals Toxic substances, Electrical hazards, Glassware breakage, Demonstration and practice of safe laboratory practices **Introduction to standard solutions and their applications.** Distinguishing between primary and secondary standards with examples. Gravimetric preparation of a primary standard solution Standardization of a secondary standard solution **Introduction to temperature measurement and the significance of accuracy.** Explanation of the concept of calibration and its necessity. Calibration of a laboratory thermometer using a reference standard (e.g., mercury thermometer) at different temperatures. Preparation of buffers: Identifying suitable weak acids and conjugate bases for buffer preparation Selecting appropriate buffer components based on desired pH range **Preparation Methods:** Calculating the amounts of acid and conjugate base needed for buffer solutions Chromatography- **Column Chromatography:** Theory and applications of separation based on adsorption, partition, and size exclusion. **Paper Chromatography:** Principles of separation on paper media, visualization techniques, and applications. **Thin Layer Chromatography (TLC):** Introduction to TLC plates, solvent systems, development techniques, and applications **Preparation of colloids:** Dispersion methods for preparing colloids, Aggregation and stabilization techniques for colloids	**30**

Keywords	*Common Hazards, Toxic Chemicals, Standard Solutions, Calibration, Buffers, Chromatography, Colloids*

Signature of Convener & Members (CBoS) :

PART–C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended –

1. *Tandon, M. M. N., (2012). BSc. Practical Chemistry. Shiva Lal Agarwal & Company.*
2. *Ahluwalia, V. K., Dhingra, S., & Dhingram, S. (2005). College Practical Chemistry. Universities Press.*
3. *Kamboj, P. C. (2014). Advanced University Practical Chemistry (Part I). Vishal Publishing Co.*
4. *Pandey, O. P., BajPai, D. N., Giri, S., (2013). Practical Chemistry, S. Chand.*

Reference Books Recommended -

1. *Seiler, J.P. (2005). Good Laboratory Practices: the why and how. Springer-Verlag Berlin and Heidelberg GmbH & Co. K; 2nd ed.*
2. *Garner, W.Y., Barge M.S., Ussary. P.J. (1992). Good Laboratory Practice Standards:Application for field and Laboratory studies. Wiley VCH.*

Online Resources–

- **https://www.youtube.com/watch?v=0m8bWKHmRMM**
- **https://www.nist.gov/system/files/documents/srm/SP260-53.PDF**
- **https://www.khanacademy.org/science/chemistry/acids-and-bases-topic**
- **https://pubs.acs.org/doi/10.1021/acs.jchemed.1c00940 -**
- **https://www.rsc.org/membership-and-community/connect-with-others/through-interests/interest-groups/colloid-and-interface-science/**

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** 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
End Semester Exam (ESE):	**Laboratory / Field Skill Performance: On spot Assessment** **A. Performed the Task based on lab. work - 20 Marks** **B. Spotting based on tools & technology (written) – 10 Marks** **C. Viva-voce (based on principle/technology) - 05 Marks**	**Managed by Course teacher as per lab. status**

Name and Signature of Convener & Members of CBoS: