(Bachelor of Science)(Undergraduate) (Industrial Chemistry Vocational)
B. Sc. (UG) Semester –IV (Effective from JUNE 2022)

Course Code	**US04CICV51**	Title of the Course	**Fluid Mechanism and Heat Transfer**
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	To make students familiar with: 1. Basis of Fluid machineries. 2. Concepts of heat transfer equipment.

Course Content		
Unit	Description	Weightage* (%)
1.	Fluids and their Classification, Viscosity, Newtonian Fluids, Static pressure, Manometer, Mechanism of fluid flow, Types of flow, Continuity equation, Bernaulli's theorm, Friction factor and Friction head.	**25%**
2.	Fluid moving machineries, Equipments, Pipes and pipe fittings, Pumps- classification and performance, Reciprocating and Rotary pumps, Centrifugal pumps, Blower, Compressors, Vacuum pump.	**25%**
3.	Modes of heat transfer, Flourier's law, Thermal conductivity, Thermal insulators, Steady state one dimensional, heat conduction equation through plane wall, cylindrical wall, spherical wall and composite structure.	**25%**
4.	Heat transfer equipment, Types of heat exchanger, Shell and tube heat exchanger, Double pipe heat exchanger, Extended surface and Plate type heat exchanger. Evaporators: Batch and continuous type, Capacity of evaporators.	**25%**

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Industrial Chemistry Vocational programme are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to ---	
1.	Learn about basic concepts of Fluid machineries and heat transfer equipment..
2.	Apply knowledge in further studies of third year B.Sc. Industrial chemistry Vocational course.

Suggested References:	
Sr. No.	References Books
1.	Introduction to Chemical Engineering, Walter. L. Badger and Juline T. Banchero (Mcgraw Hill books).
2.	Unit operations of Chemical Engineering, Mccabe and Smith, (Mcgraw Hill books).
3	Unit operations (Volume I & II), (Nirali prakashan, Pune).
4	Chemical engineering (Volume I & II), J. M. Coulson & K. F. Richardson, (Asian Books Pvt. Ltd, New Delhi)

On-line resources to be used if available as reference material
On-line Resources: Google books, INFLIBNET, Google Web

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(Bachelor of Science)(Undergraduate) (Industrial Chemistry Vocational)
B. Sc. (UG) Semester –IV (Effective from JUNE 2022)

Course Code	**US04CICV52**	Title of the Course	**Basic Analytical Chemistry**
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	To make students familiar with: 1. Basis of Data Analysis. 2. Concepts of chemical analysis and titration methods.

Course Content		
Unit	Description	Weightage* (%)
1.	Data Analysis : An analytical data evaluation : Errors, Accuracy and precision, normal distribution curve, Mean and standard deviation, comparison of results (student t-test, f- test) paired t-test, Linear regression and correlation coefficient.	**25%**
2.	Titrimetric Methods of chemical Analysis, General principle of titrimetry, Types of reaction in titrimetry, Standard solution, Basic requirements of titrimetry, Equivalence point and end point, Aqueous Acid-Base Titration, concept of acid-base titration, Titration curves, Acid-base indicators, Titration Feasibility and its application, Non-aqueous Acid - base Titrations. Role and properties of solvent, Titration in non- aqueous solvents.	**25%**
3.	Redox Titrations: Introduction, Redox systems, Redox potential, Nernst equation, Equilibrium constant, Titration curve & Feasibility, Redox indicators, Iodometric and iodimetic titrations, Complexometric Titrations: Introduction, Stability constant, Ways of detecting end point, Titration curves, Equilibrium involved in EDTA titration, Types of EDTA titrations, Titration of mixture; Selectivity, Masking and demasking, Metallochromic indicators, Applications.	**25%**
4.	Precipitation Titrations: Introduction, Feasibility and end point detection, Indicators, Volhard, Fajan and Mohr's methods, Factors affecting solubility of precipitates, Gravimetric Methods of Analysis: Principle of gravimetry, Requirements of precipitates, Formation and properties of precipitates, Coagulation & peptization, Co-	**25%**

	precipitation and occlusion, Washing, drying and ignition of precipites.	

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Industrial Chemistry Vocational programme are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to ---	
1.	Learn about basic concepts of Data Analysis, chemical analysis and titration methods.
2.	Apply knowledge in further studies of third year B.Sc. Industrial chemistry Vocational course.

Suggested References:	
Sr. No.	References Books
1.	Analytical Chemistry: Principles-by J. H. Kennedy, Saunders college publishers, 2nd edition, 1990.
2.	Introduction to Chemical Analysis - by R. D. Braun, Mc-Graw Hill, Book Co. 2nd edition, 1995.
3	Vogel's Textbook of Quantitative Chemical Analysis- by G. H. Jeffory, J. Mendham, R. C. Denney, 5th edition,1998.
4	Analytical Chemistry-by G. D. Christian, Jhon Willey & Sons,3rd edition.

5	Quantitative Analysis - by R. A. Day, Prantice hall of India (P) Ltd., New Delhi, 6th edition,1993.
6	Modem Analytical Chemistry, By David Harvey, Me Graw-Hill (USA).
7	Principles of Instrumental analysis- by D. A. Skoog & F. J. Holler & T. A. Nieman, Saunders college Publishers, 5th edition,1998.

On-line resources to be used if available as reference material
On-line Resources: Google books, INFLIBNET, Google Web

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(Bachelor of Science)(Undergraduate) (Industrial Chemistry Vocational)
B. Sc. (UG) Semester – IV (Effective from JUNE 2022)

Course Code	**US04CICV53**	Title of the Course	**Practical**
Total Credits of the Course	4	Hours per Week	8

Course Objectives:	To make students familiar with: 1. Practical aspects of Fluid machineries and heat transfer. 2. Hands on experience of estimation of metals and organic compounds.

Course Content	
Practical	Description
I	Experiments based on Fluid moving machineries and Modes of heat transfer. A demonstration of Heat transfer equipment.
II.	Preparation of various solutions, its standardization for the estimation of metals and organic compounds. Experiments based on gravimetric, complexometric Iodometry & Iodimetry methods. Analysis of inorganic substance by semi micro qualitative analysis. pH and conductometric titrations. Experiments based on an applications of Chromatographic techniques.

Teaching-Learning Methodology	Hands on training of Practical's. Courses for B. Sc. Industrial Chemistry Vocational programme are delivered through laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).

Evaluation Pattern		
Sr.No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	---
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	--

3.	University Examination	100%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Learn about Fluid machineries, heat transfer, estimation of metals and organic compounds.
2.	Apply knowledge in further studies of third year B.Sc. Industrial chemistry Vocational course.

Suggested References:	
Sr. No.	References Books:
1.	Vogel's Textbook of Quantitative Chemical Analysis, 5thEdition By G. H. Jeffery, J. Basset, J. Mendham, R. C. Denney.

On-line resources to be used if available as reference material
On-line Resources: Google books, INFLIBNET, Google Web

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