

SARDAR PATEL UNIVERSITY (Bachelor of Science) (Undergraduate)
 (Industrial Chemistry Vocational)
 B. Sc. (UG) Semester – IV (Effective from JUNE 2024)

Course Code (Major)	US04MAICV01	Title of the Course	Industrial Chemistry
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.
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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, Bernoulli's theorem, Friction factor, and Friction head	25%
2.	Fluid moving machinery: Equipment, Pipes and pipe fittings, Pumps- classification and performance, Reciprocating and Rotary pumps, Centrifugal pumps, blowers, Compressors, and Vacuum pumps.	25%
3.	Heat Transfer: Modes of heat transfer, Fourier's law, Thermal conductivity, Thermal insulators, Steady state one-dimensional heat conduction equation through the planewall, cylindrical wall, spherical wall, and composite structure. Heat transfer equipment, Types of heat exchangers, Shell and tube heat exchangers, Double pipe heat exchangers, Extended surface, and Plate type heat exchangers.	25%
4.	Compression equipment: Reciprocating compressor, Work of single-stage reciprocating compressor, Effect of clearance, Volumetric efficiency, Multistage compression. Refrigeration: COP & refrigerating effect, Industrial refrigerants, Carnot, and other refrigeration cycles. Internal combustion engines and external combustion engines, Steam power plants, working and thermodynamic analysis, Otto engine and Diesel engine.	25%

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Industrial Chemistry vocational programs are delivered through classroom, and 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, and models).
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Evaluation Pattern



Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per NEP 2020)	25%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance ((As per NEP 2020)	25%
3.	University Examination (As per NEP 2020)	50%

Course Outcomes: Having completed this course, the learner will be able to Learn about basic concepts of Fluid machineries and heat transfer equipment.

Suggested References:

Sr. No.	References
1.	Unit operation Volume I. K.A.Gavhane (NiraliPrakashan).
2.	Introduction to Chemical Engineering. W.L. Badger & J.I. Banchero (McGraw Hill).
3.	Unit operation, Volume II.Coulson& Richardson
4.	Industrial Chemistry of B K Sharma.
5.	D.; M. Gopala Rao, Marshall Sittig. Dryden's Outline of Chemical Technology for 21st Century (3rd Edition). East-West Press.;
6.	McCabe, Warren L., and Julian C. Smith. Unit Operations of Chemical Engineering. New York: McGraw-Hill, 1967.
7.	Walter L. Badger and Julius T. Banchero. Introduction to Chemical Engineering. New York: McGraw-Hill, 1955.
8.	Recommendations on Graphical Symbols for Process Flow Diagram, IS 3232 – 1965.

On-line resources to be used if available as reference material

OnlineResources: Google Books, INFLIBNET, Google Web



(Bachelor of Science) (Undergraduate) (Industrial Chemistry Vocational)
B. Sc. (UG) Semester – IV(Effective from JUNE 2024)

Course Code (Major)	US4MAICV02	Title of the Course	Introduction to Analytical Chemistry
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	To make students familiar with: 1. Basic knowledge, concepts, techniques, and principles of data analysis and analytical chemistry. 2. The principles of the most important liquid and gas chromatographic.
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Course Content		
Unit	Description	Weightage*(%)
1.	Introduction to Errors and Mistake, Classification of errors, Accuracy and precision with their difference, Minimization of error, Calibration of Instruments, Explanation of Significant figure and its laws with complete interpretation, Mean and standard deviation, variance and coefficient of variance, Absolute error and relative error, mean value, deviation and relative mean deviation, Gaussian curve and its explanation, Importance of Q-test and T-test (Student T test), Example on errors, significant figures, Q-test and T-test.	25%
2.	Redox Titrations: Introduction, Redox systems, Redox potential, Nernst equation, Equilibrium constant, Titration curve & Feasibility, Redox indicators, Iodometric and iodimetric titrations, Complexometric Titrations: Introduction, Stability constant, Ways of detecting endpoint, Titration curves, Equilibrium involved in EDTA titration, Types of EDTA titrations, Titration of mixture; Selectivity, Masking and demasking, Metallochromic indicators, Applications.	25%
3.	Precipitation Titrations - Introduction, Feasibility and end point detection, Indicators, Volhard method, Fajan method and Mohr's method, Factors affecting solubility of precipitates. Gravimetric Methods of Analysis - Principle of gravimetry, Requirements of precipitates, Formation and properties of precipitates, Coagulation & peptization, Co-precipitation and occlusion, Washing, drying and ignition of precipitate.	25%
4.	Chromatography - Introduction, Classification and applications. Paper chromatography - Introduction, Experimental details for qualitative analysis. Thin layer chromatography - Introduction, Superiority of TLC over the other techniques, Experimental techniques, Scope & limitations. Column chromatography - Introduction, Experimental details, Theory of development, factors affecting column efficiency. GC & HPLC - Introduction, Instrumentation, Sampling methods, Experimental details and applications.	25%

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Industrial Chemistry vocational program 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).
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per NEP 2020)	25%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per NEP 2020)	25%
3.	University Examination (As per NEP 2020)	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	To understand various possible errors and use significant figures in experiment reports.
2.	To acquire knowledge on basic concepts of redox and complexometric titrations.
3.	To acquire knowledge on the basic principles of precipitation titrations and gravimetric analysis.
4.	To understand various chromatography methods in the separation and identification of organic compounds.

Suggested References:	
Sr. No.	References
1.	Analytical Chemistry: Principles-by J.H.Kennedy, Saunderscollege publishers, 2 nd edition, 1990.
2.	Introduction to Chemical Analysis-by R.D.Braun, Mc-GrawHillBookCo. 2 nd edition 1995.
3.	Vogel's Textbook of Quantitative Chemical Analysis-by G.H.Jeffory, J.Mendham, R.C.Denney, 5 th edition, 1998.
4.	Analytical Chemistry-by G.D.Christian, Jhon Willey & Sons, 3 rd edition,
5.	Quantitative Analysis-by R.A.Day, Prenticehall of India(P) Ltd., New Delhi, 6 th edition, 1993.
6.	Modern Analytical Chemistry, By David Harvey, McGraw-Hill (USA).
7.	Principles of instrumental analysis-by D.A.Skoog & F.J.Holler & T.A.Nieman, Saunderscollege Publishers, 5 th edition, 1998.

On-line resources to be used if available as reference material

On-line Resources: Google books, INFLIBNET, Google Web

(Bachelor of Science) (Undergraduate) (Industrial Chemistry)
B. Sc. (UG) Semester – III (Effective from JUNE 2024)

Course Code (Major Practical)	US04MAICV03	Title of the Course	Practical (Major)
Total Credits of the Course	04	Hours per Week	08

Course Objectives:	Develop the skill to analyze and identify the materials, its testing chemicals, Develop skills in the scientific method of calibrating the glassware. Enhance the skill of preparation and standardization of analytical solutions. Develop skills unit operations.
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Course Content
Part: I (02 Credit ; 04 Hours per week) <ul style="list-style-type: none">➤ Experiments base on Heat Transfer and Fluid mechanics unit operations. Part:II (02 Credit ; 04 Hours per week) <ul style="list-style-type: none">➤ Calibration of Volumetric Glassware. And preparation of solutions➤ Experiments based on estimation of raw materials and semi micro analysis of inorganic compounds.➤ Chromatography based experiments

Teaching-Learning Methodology	Courses for B. Sc. Industrial Chemistry program 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).
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination (As per NEP 2020)	100%

Course Outcomes: Having completed this course, the learner will be able to
Acquire practical knowledge of basic chemical laboratory tools and analytical concept for the subject of industrial chemistry.

Suggested References:

1. Brian S. Furniss (1989, 5th edition) *Vogel's Textbook of Practical Organic Chemistry*. Hoboken: John Willey & Sons (ISBN: 0-582-462363).
2. Hassner, A. (2012, 3rd edition) *Organic Syntheses Based on Name Reactions*. Philadelphia: Elsevier Publishing company (ISBN: 978-0-08-096630-4).
3. Jeffery, G. H.; Bassett, J.; Mendham, J.; Denny, R. C. (1989, 5th edition) *Vogel's Textbook of Quantitative Chemical Analysis*. Hoboken: John Willey & Sons (ISBN: 0-582-44693-7).

On-line resources to be used if available as reference material

On-line Resources : Google books, INFLIBNET, Google Web

(Bachelor of Science) (Undergraduate) (Industrial Chemistry Vocational)

B. Sc. (UG) Semester – IV(Effective from JUNE 2024)

Course Code (Minor)	US04MIICV01	Title of the Course	Fluid Mechanics
Total Credits of the Course	2	Hours per Week	2
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, Bernoulli's theorem, Friction factor, and Friction head	25%
2.	Fluid moving machinery: Equipment, Pipes and pipe fittings, Pumps- classification and performance, Reciprocating and Rotary pumps, Centrifugal pumps, blowers, Compressors, and Vacuum pumps.	25%

Teaching- Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Industrial Chemistry vocational programs are delivered through classroom, and 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, and models).
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per NEP 2020)	25%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per NEP 2020)	25%
3.	University Examination	50%

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.	Learn about compression and refrigeration and steam boilers

Suggested References:

Sr. No.	References
1.	Unit operation Volume I. K.A.Gavhane (NiraliPrakashan).
2.	Introduction to Chemical Engineering. W.L. Badger & J.I. Banchero (McGraw Hill).
3.	Unit operation, Volume II.Coulson& Richardson
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5.	D.; M. Gopala Rao, Marshall Sittig. Dryden's Outline of Chemical Technology for 21st Century (3rd Edition). East-West Press.;
6.	McCabe, Warren L., and Julian C. Smith. Unit Operations of Chemical Engineering. New York: McGraw-Hill, 1967.
7.	Walter L. Badger and Julius T. Banchero. Introduction to Chemical Engineering. New York: McGraw-Hill, 1955.
8.	Recommendations on Graphical Symbols for Process Flow Diagram, IS 3232 – 1965.

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(Bachelor of Science) (Undergraduate) (Industrial Chemistry)
B. Sc. (UG) Semester – III (Effective from JUNE 2024)

Course Code (Minor Practical)	US04MIICV02	Title of the Course	Practical
Total Credits of the Course	02	Hours per Week	04

Course Objectives:	Develop the skill to analyze the concept of unit operations like Heat transfer and Drying
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Course Content
(02 Credit ; 04 Hours per week) ➤ Experiments base on fluid mechanics unit operations.

Teaching-Learning Methodology	Courses for B. Sc. Industrial Chemistry program 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).
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination (As per NEP 2020)	100%

Course Outcomes: Having completed this course, the learner will be able to concept of Unit Operations

Suggested References:
1. Brian S. Furniss (1989, 5 th edition) <i>Vogel's Textbook of Practical Organic Chemistry</i> . Hoboken: John Willey & Sons (ISBN: 0-582-462363). 2. Hassner, A. (2012, 3 rd edition) <i>Organic Syntheses Based on Name Reactions</i> . Philadelphia: Elsevier Publishing company (ISBN: 978-0-08-096630-4).