



SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus with effect from the Academic Year 2023 - 2024

B.Sc. (Industrial Chemistry) Sem. 2

Course Code	US02MAICH01	Title of the Course	Process Calculation and Engineering Equipment
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	To make students familiar with: 1. Calculation of Process & Chemical Engineering as a subject. 2. Basic concepts related to Chemical Engineering, Engineering drawing.
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Course Content

Unit	Description	Weightage*(%)
1.	UNITS AND DIMENSIONS Units for composition of systems, Ideal gas equation, behavior of gaseous mixture, Roul't's Law, Henry's Law, vapor pressure of liquids and solutions.	25%
2.	CHEMICAL ENGINEERING EQUIPMENT DRAWING Symbols of Chemical Engineering Equipment's: Refer and draw the standard code / decodes and symbols for Chemical Engineering equipment's. Diagrams of mounting and fitting parts Prepare sketches of various types of Valves, Pipe fittings, Joints etc.	25%
3.	DIAGRAMS FOR CHEMICAL ENGINEERING Diagrams for Chemical Engineering Unit Operations Free hand sketch drawing of various Chemical Engineering Unit Operation equipment's. Flow diagrams drawing preparation of block flow diagram and process flow diagrams using different equipment symbols for a process.	25%
4.	WATER Characteristic of water, uses of water, impurities and hardness of natural water, water for steam making and industrial processes, Boiler water treatments, Calculations on water treatments.	25%

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. 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
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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.	To draw and understand symbols of chemical engineering equipment's & draw diagrams of various mounting and fitting parts.
2.	To draw diagrams and understand various unit operation equipment's for chemical engineering. To draw flow diagrams for a process.
3.	To learn unit & dimension for the system & water as an plat auxilliary.

Suggested References:

Sr. No.	References
1.	Unit operation Volume I. K.A.Gavhane (Nirali Prakashan).
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

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



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B.Sc. (Industrial Chemistry) Sem. 2

Course Code	US02MAICH02	Title of the Course	Industrial Chemistry Practical
Total Credits of the Course	4	Hours per Week	8

Course Objectives:	To make students familiar with chemical analysis and water analysis.
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Course Content
Part: I (02 Credit ; 04 Hours per week) <ul style="list-style-type: none">➤ Inorganic Qualitative Analysis (Two Radicals)➤ Drawing preparation of block flow diagram and process flow diagrams using different equipment symbols for a process.
Part: II (02 Credit ; 04 Hours per week) <ul style="list-style-type: none">➤ Introduction, Total solid & Volatile solid,➤ Total Dissolved Solid, Total Suspended Solid➤ Non filterable & Filterable solid & Non filterable volatile Solid➤ Acidity, Alkalinity & Turbidity➤ Hardness of Water & EDTA methods for determination of hardness of water

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	100%

Course Outcomes: Having completed this course, the learner will be able to
General Introduction, practical knowledge of industrial block diagram also to learn the concept of utility, analysis and important of water for chemical industries., Mono functional qualitative analysis of organic compounds.

Suggested References:

1. Madan, R. L. (2011, 3rd edition) *Chemistry for degree student First year*. New Delhi: S. Chand (ISBN: 978-8121932301).
2. Peter Atkins, Tina Overton, JonarthanRourke, Mark Weller & Fraser Armstrong (2010, 5thedition) *Inorganic Chemistry*. Oxford: Oxford University Press (ISBN: 978-0-19-959960-8).
3. Recommendations on Graphical Symbols for Process Flow Diagram, IS: 3232 – 1965.
4. Brian S. Furniss (1989, 5thedition) *Vogel's Textbook of Practical Organic Chemistry*. Hoboken: John Willey & Sons (ISBN: 0-582-462363).

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B.Sc. (Industrial Chemistry) Sem. 2

Course Code	US02MIICH01	Title of the Course	Introduction to Industrial Chemistry-II
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	To make students familiar with basic concepts related to Chemical Engineering and Engineering drawing. Also water treatment in chemical industries.
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Course Content		
Unit	Description	Weightage*(%)
1.	Diagrams for Chemical Engineering Unit Operations Free hand sketch drawing of various Chemical Engineering Unit Operation equipment's. Flow diagrams drawing preparation of block flow diagram and process flow diagrams using different equipment symbols for a process.	50%
2.	Characteristic of water, uses of water, impurities and hardness of natural water, water for steam making and industrial processes, Boiler water treatments, Calculations on water treatments.	50%

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. 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.	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.	General Introduction, knowledge, and definition of various materials and their basic properties.

2.	To learn the concept of utility, analysis and important of water for chemical industries.
3.	To draw and understand symbols of chemical engineering equipment's & draw diagrams of various mounting and fitting parts.
4.	To draw diagrams and understand various unit operation equipment's for chemical engineering. To draw flow diagrams for a process.

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.
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B.Sc. (Industrial Chemistry) Sem. 2

Course Code	US02MIICH02	Title of the Course	Industrial Chemistry Practical
Total Credits of the Course	2	Hours per Week	4

Course Objectives:	To make students familiar with chemical analysis and water analysis.
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Course Content
<ul style="list-style-type: none">➤ Inorganic Qualitative Analysis (Water Soluble colored compound)➤ Introduction, Total solid & Volatile solid,➤ Total Dissolved Solid, Total Suspended Solid➤ Non filterable & Filterable solid & Non filterable volatile Solid➤ Acidity, Alkalinity & Turbidity➤ Hardness of Water & EDTA methods for determination of hardness of water.

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	100%

Course Outcomes: Having completed this course, the learner will be able to
General Introduction, knowledge, and definition of various materials and their basic properties., To learn the concept of utility, analysis and important of water for chemical industries., Mono functional qualitative analysis of organic compounds.

Suggested References:

1. Madan, R. L. (2011, 3rd edition) *Chemistry for degree student First year*. New Delhi: S. Chand (ISBN: 978-8121932301).
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B.Sc. (Industrial Chemistry) Sem. 2

Course Code	US02SEICH01	Title of the Course	Industrial Safety & Hygiene - 1
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	<ul style="list-style-type: none">➤ Students will understand the basic concepts of safety in chemical industries.➤ It will increase the knowhow of various safety procedures and measures taken at plant site during working with hazardous chemicals.
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Course Content		
Unit	Description	Weightage*(%)
1.	Safety in chemical industries Place of chemical industries in society, statutory provisions, Types of chemical hazard & its control, General safety precautions.	50%
2.	Process Hazard & its control, Utility Hazard & its control, safety transportation of chemicals, Checklist of Routine inspections chemical factories, Types of tests, certificates & Records. Permits for vessel entry.	50%

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. 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.	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%
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Course Outcomes: Having completed this course, the learner will be able to

Students will understand the basic concepts of fire and safety at industry. It will increase the knowhow of various safety procedures and measures taken at plant site during working with hazardous chemicals.

Suggested References:

1. Fundamental of industrial safety & Health –volume-1 by Dr. K.U.Mistry
2. Fundamental of industrial safety & Health –volume-2 by Dr. K.U.Mistry

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B.Sc. (Industrial Chemistry) Sem. 2

Course Code	US02IDICH01	Title of the Course	Introduction to Instrumentation and Process <i>Control-II</i>
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	To make students familiar with: Basic concepts related to temperature, pressure and level flow.
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Course Content		
Unit	Description	Weightage*(%)
1.	TEMPERATURE AND PRESSURE MEASUREMENTS Temperature Measurement Instruments such as Expansion Thermometers, Filled System Thermometers, Thermoelectricity Based; Industrial thermocouple, response of thermocouples and other Electrical temperature-based sensors, Radiation and optical pyrometers, Pressure measurements instruments such as liquid column elements, elastic element gauge, electrical transducer, Forced Balanced devices.	50%
2.	LEVEL, FLOW, VISCOSITY AND DENSITY MEASUREMENTS Direct and indirect measurement of liquid level, different head flow meters, area flow meters, total flow measuring instruments, viscosity measurements of polymer solutions and polymer melt, and density measurement system.	50%

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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

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| 1. | Acquire knowledge of temperature, pressure measurement and concept of flow measurement. |
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Suggested References:

Sr. No.	References
1.	Process Instrumentation and Control by A P Kulkarni, Nirali Prakashan.
2.	Industrial Instrumentation & Process Control by Kulkarni
3.	Unit Operations: Volume I & II, by K. A. Gavhane
4.	Arun Bahl, B. S. Bahl, G. D. Tuli, Essential of Physical chemistry. New Delhi: S. Chand publication; 2009.
5.	Dr. A. S. Patel, Dr. K. M. Shah, Applied Science I: Chemistry, Ahmedabad, Atul Prakashan; 2000

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