Swami Ramanand Teerth Marathwada University, Nanded.

Faculty of Science

B. O. S. In Chemistry

B.Sc. First Year (Industrial Chemistry)

Semester-I &II

CBCS

In force from June – 2016

Distribution of credits for B.Sc. Industrial Chemistry (optional)

Under Faculty of Science

B.Sc. Syllabus structure

Semester Pattern effective from June - 2016

Subject: Industrial Chemistry

B.Sc. First Year (Semester-I&II)

Total credits semester I and II: 12

Semester	Paper No.	Name of the Course	Instruction Hrs/week	Total period	Internal Evaluation	Marks of Semester	Total Marks	Credits
I	CCIC I (Section-A)	Unit Operation-I P-I	03	45	10	40	50	2
	CCIC I (Section-B)	Process Calculation-I P-II	03	45	10	40	50	2
II	CCIC II (Section - A)	Unit Operation II, P-III	03	45	10	40	50	2
	CCIC II (Section -B)	Process Calculation-II, P-IV	03	45	10	40	50	2
	CCICP-I (CCIC- I&II), (section A&B)	Practical's based on Section A & Section B of(CCIC-I&II) (P-V)	04	20 Practical's	20	80	100	4
Total credits semester I and II:								**12**

Note:

- **The syllabus is based on six (3x2) theory periods and four practical periods per batch per week.**
- **Candidates should require passing separately in theory and practical examination.**
- **Theoryexamination40 marks (30+10MCQfor each paper).**
- **Internalevaluation10 marks (test for assignment and attendance).**
- **At least twenty practical should be taken: 10 practical fromSectionAand10fromSection B.**

B. Sc. Second Year (Semester III&IV)

Total credits semester III and IV:12(4*)

Semester	Paper No.	Name of the Course	Instruction Hrs/week	Total period	Internal Evaluation	Marks of Semester	Total Marks	Credits
III	CCIC III (Section A)	Unit Operation-III Paper - VI	03	45	10	40	50	2
	CCIC III (Section B)	Chemical Reaction Engineering. (P-VII)	03	45	10	40	50	2
	CCICP-II(CCIC-III& IV) (section A)	Practical's based on P-VI&P-VIII(P-X)	04	20 Practical's	10	40	50	2
	CCICP-II(CCIC-III&IV), (section A)	SEC I (1Skill/Optional)			**15x3=45**			**(02)***
IV	CCIC IV (Section A)	Unit Operation-IV (P-VIII)	03	45	10	40	50	2
	CCIC IV (Section B)	Pollution monitoring and Control (P-IX)	03	45	10	40	50	2
	CCICP-III(CCIC-III&IV), (section B)	Practical's based on P-VII and P-IX (P-XI)	04	20 Practical's	10	40	50	2
	CCICP-III (CCIC-III & IV), (section B)	SEC II (1Skill/Optional)			**15x3=45**			**(02)***
							Total credits semester III and IV:	**12(4)***

Note:

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- **Candidates should require passing separately in theory and practical examination.**
- **Theoryexamination40 marks (30+10MCQfor each paper).**
- **Internalevaluation10 marks (test for assignment and attendance).**
- **At least twenty practical should be taken: 10 practical fromSectionAand10 from Section B.**

B. Sc. Third Year (Semester V&VI)

Total credits semester V and VI:12

Semester	Paper No.	Name of the Course	Instruction Hrs/week	Total period	Internal Evaluation	Marks of Semester	Total Marks	Credits
V	DECIC I [(Section A)Elective]	Unit Process in Organic Synthesis (P-XII) **OR** Chemical Engineering Thermodynamics	03	45	10	40	50	2
	DECIC I (Section B)	Process equipment design and process Instrumentation -(P-XIII)	03	45	10	40	50	2
	DECICP-I (DECIC-I& II) (section A)	Practical's based on P-XII&P-XIV (P-XVI)	04	20 Practical's	10	40	50	2
	DECICP-II (DECIC-I & II) (section A)	SEC II (1Skill/Optional)			**15x3=45**			**(02)***
VI	DECIC II (Section A) (Elective)	Unit Process in Inorganic Synthesis Drug Dyes and Industrial Safety (P-XIV) OR Introduction to Drug Design (P-XIV)	03	45	10	40	50	2
	DECIC II (Section-B)	Spectroscopy & chromatography, Plant Utilities (P- XV)	03	45	10	40	50	2
	(DECIC-I& II) (section B)	Practical's based on P-XIII&P-XV (P-XVI)	04	20 Practical's	10	40	50	2
	DECICP-IV (section B)	SEC IV (Project Work)			**50**		**50**	**(02)***
						Total credits semester V and VI:		**12(4)***

Note:

- **The syllabus is based on six(3x2) theory periods and four practical periods per batch per week.**
- **Candidates should require passing separately in theory and practical examination.**
- **Theoryexamination40 marks (30+10MCQfor each paper).**
- **Internalevaluation10 marks (test for assignment and attendance).**
- **At least twenty practical should be taken: 10 practical fromSectionAand10 from Section B.**

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure (New scheme)

B. Sc. First year (Semester-I)

Semester Pattern effectivefrom-2016

Industrial Chemistry

CCIC-I (Section-A)

Unit Operation (P-I)

Credits:02

Marks:60 **Periods:45**

UNIT-I

Fluid Mechanics-I: **10P**

1.1 Flow of Fluids: Definitions of fluids, Classification of fluids, Properties of fluids, Fluid Pressure, Pressure Head, Hydrostatic equilibrium for compressible and incompressible fluids.

1.2 Application of fluid statics: Manometers, U-tube manometer, Inclined Manometer, Differential Manometer, Continuous gravity decanter.

Unit-II

Fluid Mechanics-II: **10P**

2.1. Fluid Flow Phenomena: Types of flow, Laminar flow, Shear Rate and Shear Stress, Turbulence-Reynolds number & Transition from Laminar to Turbulent flow, Reynolds experiment, Boundary layers, Flow in boundary layers, Laminar and Turbulent flow in boundary layers.

UNIT-III **10P**

3.1. Basic Equations of fluid flow: Equation of Continuity, Bernoulli's equation, Pump work in Bernoulli's equation and its application**.**

Unit-IV

4.1. Transportation and Metering of fluids: **15P**

Transportation of fluids: Pipe, Tubing, Fittings & valves. Pumps: Classification of Pump, Developed head, Power requirement, Suction lift and cavitations, Positive- displacement pumps, Reciprocating pumps, Rotary pumps, Centrifugal pumps, Centrifugal pump theory, Ideal pump, Actual pump performance, Power consumption, Efficiency. Air Binding and Pump Priming, Losses in Centrifugal Pump, Centrifugal Pump troubles & Remedies, Pump fails to start pumping, Pump is working but not up to the capacity and pressure, Pump starts and then stop pumping, Pump takes too much power.

Metering of fluids: Full bore meters- Principle, Construction and Working, Advantages and Disadvantages of Venturimeter , Orifice meter , Pitot Tube, Rotameter.

Refferance Book:

1) Unit Operation I by K.A.Gavhane.

2) Unit Operation I by Mc Cabe Smith.

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B. Sc. First year (Semester-I)

Semester Pattern effectivefrom-2016

Industrial Chemistry

CCICI (Section-B)

Process Calculation (P-II)

Marks:50 **Periods:45**

UNIT-I **08P**

1.1 Units and Dimensions: Introduction, Dimensions & Systems of Units, Fundamental Quantities, Derived Quantities, Conversions & Problems.

UNIT -II **13P**

2.1 Basic Chemical Calculations: Introduction, Mole, Atomic Mass & Molar Mass, Equivalent Mass, Solids, Liquids & Solutions, Important Physical, Properties of Solutions, Gases & Problems

UNIT-III **12P**

3.1 Material balances without chemical reactions: Classification of Material Balance Problems, Material balances without chemical reactions, Outline of Procedure for Material Balance Calculations, Distillation, Evaporation, Absorption, Extraction, Drying, Filtration, Mixing, Crystallization and Problems on Material Balances.

UNIT -IV **12P**

2.2 Material Balances with Chemical Reactions: Stoichiometry, Stoichiometric Equations, Stoichiometric Coefficients, Stoichometric ratio, Limiting reactant, Excess reactant, Conversion, Yield and Selectivity and Problems on Material Balances with Chemical Reactions.

Swami Ramanand Teerth Marathwada University Nanded

Choice Based Credit System (CBCS) Course Structure (New scheme)

B. Sc. First year (Semester-II)

Semester Pattern effectivefrom-2016

Industrial Chemistry

CCICI (Section-A)

Unit Operation II (P-III)

UNIT I

Heat Transfer: **10P**

1.1 Conduction: Basic law of Conduction, Thermal conductivity, Compound resistances in series, Heat flow through a Cylinder.

1.2. Convection: Classification of Convection.

1.3. Radiation: Absorptivity, Reflectivity and Transmissivity, Krichhoff's law, Laws of black body radiation, Steafan-Boltsmann law, Heat Transfer by radiation.

Unit-II

2.1. Heat Exchange Equipments: **10P**

Single pass tubular condenser, Double pipe heat exchanger, Counter Current and Parallel flow, Energy Balances, Enthalpy balances in heat exchangers, Enthalpy balances in total condensers, Overall Heat Transfer Coefficients, LMTD, Individual Heat Transfer Coefficient, Calculation of Overall Coefficients from individual coefficients, fouling factors.

UNIT-III

Industrial Aspects of Chemistry: **10P**

3.1. Glass: Introduction, physical & Chemical Properties of Glass, Characteristics, Raw Materials, Chemical Reactions, Methods of Manufacture of Glass & Uses.

Unit-IV

Pulp & Paper: **07P**

4.1 . Introduction ,manufacture of pulp,chemical process,sulphate of pulp,sulphate pulp,Rag pulp Manufacture of Paper, Caladering, Uses of Paper

4.2. Cement: **08P**

Introduction, Composition, Types of Cement, Raw Materials, Manufacture of Cement by Wet & Dry Process, Reactions in the Kiln, Setting of Cement, Testing & Uses of Cement.

Reference Books:

1. Unit Operations of Chemical Engineering- McCabe Smith

2. Unit Operations-I (Fluid Flow & Mechanical Operations)- K. A. Gavhane
3. Unit Operations-II (Heat & Mass Transfer)- K. A. Gavhane
4. Heat Transfer- K. A. Gavhan
5. Principles of Heat Transfer & Mass Transfer- S. D. Dawande
6. Industrial Chemistry- B. K. Sharma.

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Choice Based Credit System (CBCS) Course Structure (New scheme)

B. Sc. First year (Semester-II)

Semester Pattern effectivefrom-2016

Industrial Chemistry

CCIC-II (Section-B)

Process Calculation –II (P-IV)

Marks:50 **Periods:45**

UNIT-I **20P**

1.1 Energy balances: Forms of Energy, Kinetic Energy, Potential Energy, Internal Energy, Heat, Work, General Energy Balance Procedure, Energy Balances on Closed Systems, Heat Capacity, Relation between Cp & Cv for an Ideal Gas, Empirical equation for Heat Capacities, Mean Molal Heat Capacities of Gases, Heat Capacities of gaseous mixture, Enthalpy Changes Accompanying Chemical Reactions, Heat of Reaction, Heat of Formation, Standard Heat of Formation, Heat of Combustion, Hess's law of Constant Heat Summation, standard Heat of reaction from heat of formation, Standard Heat of Reaction from Heats of Combustion, Effect of temperature on Heat of Reaction, Effect of Pressure on Heat of Reaction, Adiabatic Process, Adiabatic Reaction, Adiabatic Reaction Temperature, Phase Change Operation, Latent Heat of Vaporization, Latent Heat of Fusion, Latent Heat of Sublimation, Energy Balance during Phase Change Operation, Heat of solution and Heat of Mixing. (Numerical)

Unit-II **10P**

2.1 Recycle Operations: Fuels. recycling-meaning & purpose Recycle Stream, Recycle Operation –block diagram, Purging Operation, Recycle reactor with purge, Combined feed ratio, Recycle ratio, Purge ratio, Examples

UNIT-III **07P**

3.1 Fuels: Introduction, Calorific Value, Classification & Properties of Fuels.

Solid Fuels: Properties, Composition & Analysis of Coal.

Gaseous Fuels*:* Classification, Natural Gas, and LPG.

Liquid Fuels: Petroleum, Composition & Classification, Definition of Flash Point & Fire Point, Knocking, Octane Number, Aniline Point, Refining of Petroleum, Cracking, Thermal & Catalytic Cracking, Reforming, Thermal & Catalytic Reforming.

Unit-IV **08P**

4.1. Water Analysis: Chemical & Physical Examination of Water, Chemical Substances affecting potability, Colour, Turbidity, Odour, Taste, Temperature, pH, Conductivity, Suspended Solids, Acidity, Alkalinity, Free Chlorine, Calcium & Magnesium, Dissolved Oxygen, Biochemical Oxygen Demand, Chemical Oxygen Demand.

Note: 60 % Weightage will be given to Problems.

Reference Books:

1. Chemical Process Principles- Hougen & Watson.
2. Stoichiometry- B. I. Bhatt & S. M. Vora.
3. Introduction to Process Calculations (Stoichiometry)- K. A. Gavhane.
4. Industrial Chemistry By B. K. Shara.

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Choice Based Credit System (CBCS) Course Structure (New scheme)

B. Sc. First year (Semester-II)

Semester Pattern effectivefrom-2016

Industrial Chemistry

CCIC (I &II)(Section A&B)

(P-V)

Marks: 100 **Practical's: 20**

List of Experiments to be taken:

1. To Determine the Co-efficient of Venutrimeter.
2. To Determine the Co-efficient of Orifice meter.
3. To Study the Characteristics of Centrifugal Pump.
4. To Verify Hagen-Poisellue's Equation.
5. To Study the Pipe Fittings Test Rig.
6. To Study the Thermal Conductivity of Bad Conductor.
7. Determination of Acid Value of Lubricating oil.
8. Determination of Saponification Value of Lubricating oil.
9. Determination of Viscosity of Lubricant by Red Wood Viscometer.
10. Determination of Flash & Fire Point of Lubricating oil by
    a) Cleveland's Apparatus (Open Cup)
    b) Abel's Apparatus (Closed Cup)
    c) Pensky-Marten's Apparatus (Closed Cup).
11. Determination of hardness of water.
12. Determination of percentage of iron in cement (Volumetrically).
13. Determination of amount of available chlorine in Bleaching powder.
14. Estimation of calcium in limestone.
15. Determination of dissolved oxygen (DO),
16. Determination of chemical oxygen demand (COD) in given wastewater sample.
17. To measure the density of various liquids by pyknometer .
18. To Determine the Chloride Content of water by Mohr's Method.
19. Determination of NaOH & Na_2CO_3 in the given alkali mixture solution
20. Determination of Alkalinity of Water sample .

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B. Sc. First year (Semester-II)

Semester Pattern effectivefrom-2016

Industrial Chemistry

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Semester Pattern effectivefrom-2016

Industrial Chemistry

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CCICII(Section-B)

Dosageforms,PurityofDrugsandBiostatistics(P-IV)

Marks:50 **Periods:45**