।। सा विद्या या विमुक्तये ।।

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (1-BOARD OF STUDIES) SECTION

Phone: (02462) 229542
Fax : (02462) 229574

Website: www.srtmun.ac.in

E-mail: bos.srtmun@gmail.com

संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील द्वितीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०–२१ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक २० जून २०२० रोजी संपन्न झालेल्या ४७व्या मा. विद्या परिषद बैठकीतील विषय क्र.११/४७–२०२०**च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील द्वितीय वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०–२१ पासून लागू करण्यात येत आहेत.

1. B.Sc.-II Year-Biophysics	2. B.Sc.-II Year-Bioinformatics
3. B.Sc.-II Year-Biotechnology	4. B.Sc.-II Year-Biotechnology (Vocational)
5. B.Sc.-II Year-Food Science	6. B.Sc.-II Year-Botany
7. B.Sc.-II Year-Horticulture	8. B.Sc.-II Year-Agro Chemical Fertilizers
9. B.Sc.-II Year-Analytical Chemistry	10. B.Sc.-II Year-Biochemistry
11. B.Sc.-II Year-Chemistry	12. B.Sc.-II Year-Dyes & Drugs Chemistry
13. B.Sc.-II Year-Industrial Chemistry	14. B.C.A. (Bachelor of Computer Application)-II Year
15. B.I.T. (Bachelor of Information Technology)-II Year	16. B.Sc.-II Year-Computer Science
17. B.Sc.-II Year-Network Technology	18. B.Sc.-II Year-Computer Application (Optional)
19. B.Sc.-II Year-Computer Science (Optional)	20. B.Sc.-II Year-Information Technology (Optional)
21. B.Sc.-II Year-Software Engineering	22. B.Sc.-II Year-Dairy Science
23. B.Sc.-II Year-Electronics	24. B.Sc.-II Year-Environmental Science
25. B.Sc.-II Year-Fishery Science	26. B.Sc.-II Year-Geology
27. B.Sc.-II Year-Mathematics	28. B.Sc.-II Year-Microbiology
29. B.Sc.-II year Agricultural Microbiology	30. B.Sc.-II Year-Physics
31. B.Sc.-II Year Statistics	32. B.Sc.-II Year-Zoology

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक–१/परिपत्रक/पदवी–सीबीसीएस अभ्यासक्रम/२०२०–२१/**३३३**

दिनांक : १५.०७.२०२०.

स्वाक्षरित/–
उपकुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :
१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.

SwamiRamanandTeerthMarathwadaUniversity, Nanded

Faculty of Science & Technology

B. O. S. In Industrial Chemistry

B.Sc. Second Year

Semester III & IV

CBCS

In force from – 2020

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

Semester	Course No.	Name of the Course	Instruction Hrs./week	Total period	CA	ESE	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 04	Practical's 8 8	05 05	20 20	25 25	1 1
	SECIC I	SEC I (Any one Skill from Optional)	02	02	**25**	25	50	(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 04	Practical's 08 08	05 05	20 20	25 25	1 1
	SECICII	SEC II (Any one Skill from Optional)	02	02	25	25	50	(02) *
Total credits semester III and IV:								**12(04) ***

Note:
ESE of CCICP II , CCICPE III& SECIC I, SCCIC II should be evaluated annually.

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure (New scheme)
B. Sc. Second year (Semester-III)
Semester Pattern effectivefrom-2020
Industrial Chemistry
CCIC III
(Section-A)
Unit Operation-III (P-IV

Unit-I

1.1Overview of Mass Transfer Operations

General Overview – Introduction to Mass Transfer operations, Benefits, General Principles of Mass Transfer, Importance & Classification of Mass Transfer Operations. **04 periods** **1.2Distillation**

12 Periods

Introduction, Flash Distillation, Simple Distillation, Steam Distillation, Rectification, Material Balances in Plate Columns, Number of Ideal Plates, McCabe Thiele Method, constant molal overflow, Reflux Ratio, Condenser and Top Plate, Bottom Plate and Reboiler, Feed Plate, Minimum Reflux, Optimum Reflux Ratio, Plate Efficiency, Types, Relations, Factors influencing plate efficiency, Rectification in packed towers, Batch Distillation, numericals.

Unit - II

Liquid Extraction **09 Periods**

Terminology, Introduction to liquid-liquid extraction, Applications of Liquid-Liquid Extraction, Principles of liquid-liquid equilibria, Triangular diagrams, Types of extraction system, I & II, Temperature effects on systems types, Solvent selection, Commercial extraction system, Typical extraction system, Extraction Calculations-Single Stage Operations, Multi Stage Cross Current Operation, Continuous multistage counter current operations

Unit – III

Gas Absorption **08 Periods**

Introduction, Design of Packed Towers, Contact between Liquid & Gas, Pressure drop & limiting flow rates, Principles of absorption material balances, Limiting gas-liquid ratio, Temperature variations in packed towers, Rate of absorption, Calculation of tower height, Number of Transfer units,numericals.

Unit - IV

Crystallization **12Periods**

Importance of Crystal Size, Crystal Geography, Crystallographic systems, Invariant Crystals, Principles of Crystallization, Purity of Product, Equilibria& its yields, Enthalpy Balances, Super Saturation, Units of Super Saturation, Temperature differential as a potential, Nucleation-Origins of Crystals in crystallizers, Primary nucleation, Homogeneous nucleation, Equilibrium, Kelvin Equation, Rate of nucleation, Heterogeneous nucleation, Secondary nucleation, Contact nucleation, Crystal Growth-Individual & overall Growth Coefficients, Growth Rate, Mass Transfer Coefficient, Surface Growth Coefficient, ΔL law of crystal growth, Crystallization Equipment-variations in crystallizers, Vacuum Crystallizers, Draft Tube Baffle Crystallizer, Yield of Vacuum Crystallizer,numericals.

Objective (S)	To acquire basic knowledge about unit operations such as Distillation,LiquidExtraction,Gas Absorption Crystallization
Course Outcome(S)	
CO1	To learn the unit Operation Distillation of various distillation process such as steam distillation and Fractional distillation
CO2	Explain the Various Industrial liquid liquid Extraction process
CO3	Intercepts the theoretical & Experimental Methods of Gas absorption and various columns
CO4	To Illustrate the knowledge of various crystallizers with construction and working .

Reference Books:

1. Unit Operations of Chemical Engineering – W.L.McCabe, J.C. Smith, PterHarriott
2. Mass Transfer Operations- Robbert E. Treybal
3. Chemical Engineering Vol.2 – J.M.Coulson&J.F.Richardson
4. Principles of Mass Transfer Operations- Kiran D. Patil
   (NiraliPrakashan, Pune)
5. Unit Operations-I & II – K.A.Gavhane
   (NiraliPrakashan, Pune)
6. Industrial Chemistry – B.K. Sharma(Goel Publishing House, Meerut

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure (New scheme)
B. Sc. Second year (Semester-III)
Semester Pattern effectivefrom-2020
Industrial Chemistry
CCIC III (Section B)
Chemical Reaction Engineering. (P-VII)
Credits:02

Unit – I

Ovierview of Chemical Reaction Engineering

Typical

Chemical Process, chemical kinetics, classification of chemical reaction, rate of chemical reaction, factor affecting rate of reaction, concentration dependent term of a rate equation. **05 Periods**

Unit – II

Kinetics of Homogeneous Reaction 13 Periods

Rate constant, reaction mechanism, elementary and nonelementary reaction, difference between elementary and nonelementary reaction, molecularity of reaction, order of reaction, difference between molecularity and order of reaction, representation of elementary reaction, representation of nonelementary reaction, kinetic models of nonelementary reaction,examples of mechanism of various kinds, testing kinetic models, temperature dependent term of rate equation, temperature dependency from Arrhenius' law, activation energy, activation energy significance, activation energy and temperature dependency, temperature dependency from collision theory, temperature dependent from transition state theory, comparison of theories, comparison of theories with Arrhenius' law, temperature dependency from thermo dynamics, examples .

Unit – III

Interpretation of Batch Reactor Data13 Periods

Method for analyzing kinetic data, integral v/s differential method, constant volume batch reactor, examples of constant volume system, relation of concentration & conversion of A for constant volume batch system, analysis of total pressure data obtained in a constant volume system , use of ideal gas law to calculate C_{AO}, integral method of analysis of rate data, integrated rate equations for different order reactions, irreversible unimolecular type first order reactions, characteristics of first order reaction, irreversible bimolecular type second order reactions, characteristics of second order reaction, irreversible second order reaction with different consternation of A and B, zero order reaction, characteristics of zero order reactions, irreversible third order reaction, empirical rate equation for n^{th}-order reactions, half-life method, irreversible reaction in parallel, irreversible reaction in series, autocatalytic reaction, reversible reactions, variable-volume batch reactor, integrated rate equation for zero-order reaction (variable-volume), integrated rate equation for first-order reaction (variable-volume), integrated rate equation for second-order reaction (variable-volume), examples.

Unit - IV

Design of single ideal reactors 14 Periods

Chemical reactor, batch reactor, semi batch reactor , continuous reactors, tank reactors, tubular reactor, fixed-bed reactors, fluidized-bed reactor, ideal reactors, material balance over an element of reactor volume, energy balance over an element of reactor volume, relationship between C_A and

X_A, relationship between F_A, C_A and X_A, ideal batch reactor -performance equation, graphical representation of performance equations, space time, space velocity, steady-state mixed flow reactor, graphical representation of performance equations, performance equation for first-order reactions, fractional conversion in terms of damkohler number, steady-state plug flow reactor, performance equation for first-order reaction, performance equation for second-order reaction, graphical representation of performance equations, holding time and space time for flow reactors, examples. **14 Periods**

Reference Books:

1. Chemical Reaction Engineering - Octave Levenspiel
   (Wiley India Pvt. Ltd. Third Edn.)
2. Chemical Reaction Engineering -K.A.Gavhane
   (NiraliPrakashan, Pune)Principles of Reaction Engineering – S.D.Dawande

Objective (S)	To acquire basic knowledge about **Chemical Reaction Engineering**
Course Outcome(S)	
CO1	To learn the Over view of Chemical Reaction Engineering
CO2	Explain the Various Industrial Kinetics of Homogeneous Reaction
CO3	To steady Interpretation of Batch Reactor Data
CO4	To Illustrate the knowledge of various Design of single ideal reactors with construction and working.

Reference Books:

3. Chemical Reaction Engineering - Octave Leven spiel
   (Wiley India Pvt. Ltd. Third Edn.)
4. Chemical Reaction Engineering -K.A. Gavhane
   (Nirali Prakashan, Pune)Principles of Reaction Engineering – S.D. Dawande

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure (New scheme)
B. Sc. Second year (Semester-IV)
Semester Pattern effectivefrom-2020
Industrial Chemistry

CCIC III (Section A)
Unit Operation-IV (P-VIII)

Credits:02

Unit – I
Drying of Solids 13 **Periods**

Introduction, Classification of Dryers, Solid handling in dryers, Principles of Drying-Temperature Pattern in dryers, Heat Transfer in dryers, Heat duty, Heat Transfer Coefficient, Heat Transfer Units, Mass Transfer in Dryers, Phase Equillibra-equillibrium moisture and free moisture, Bound & unbound water, Cross circulating drying-constant drying conditions, Rate of drying, Constant rate period, Critical Moisture Content & Falling Rate Period, Calculation of Drying Time under constant drying conditions, Drying Equipments-Dryers for Solids & Pastes, Dryers for Solutions & Slurries.numericals.

Unit – I
Evaporation **13 Periods**

Introduction, Liquid Characteristics, Types of Evaporators, Performance of Tubular Evaporators, Evaporator Capacity, Boiling Point Elevation and Duhring Rule, Effect of liquid head & friction on temperature drop, Heat Transfer Coefficient, Overall Coefficient, Evaporator economy, Enthalpy balance for single effect evaporator, Enthalpy balance with negligible heat of dilution, Single effect calculations, Multiple effect evaporators, Methods of feeding, Capacity and economy of multiple effect evaporator, Effect of liquid head and boiling point elevation.numericals.

Unit – III
Size Reduction **07 Periods**

Introduction, Principles of Comminution, Criteria for comminution, Characteristics of comminuted products, Energy & Power requirements in comminution, Crushing efficiency, Empirical relationship-Rittingers& Kicks Law, Bond Crushing Law & Work Index, Size reduction equipment's,numericals.

Unit - IV
Diffusion **13 Periods**

Introduction, Defination, Mechanism(Ficks Law) ,Molecular diffusion in gases and liquids, steady state diffusion of A through non-diffsingB, steady state equimolar counter diffusion, analogy of film theory in mass transfer with that in heat transfer, film theory, surface renewal, penetration,theory,equilibrium,diffusion between phases,material balances of co-current and counter-current, numericals.

Reference Books:

1.Unit Operations of Chemical Engineering – W.L.McCabe, J.C. Smith, PterHarriott
2.Mass Transfer Operations- Robbert E. Treybal
3.Chemical Engineering Vol.2 – J.M.Coulson&J.F.Richardson
4.Principles of Mass Transfer Operations- Kiran D. Pati(NiraliPrakashan, Pune)
5. Unit Operations-I & II – K.A.Gavhane(NiraliPrakashan, Pune)
6.Industrial Chemistry – B.K. Sharma (Goel Publishing House, Meerut)

Objective (S)	To acquire basic knowledge about unit operations such as Drying of Solids , Evaporation, Size Reduction ,Diffusion
Course Outcome(S)	
CO1	To learn the unit Operation Distillation of various Drying Industrial operation instruments with construction and working
CO2	Explain the Various Industrial Evaporation Process
CO3	Intercepts the theoretical & Experimental Methods of Size reduction process
CO4	To Illustrate the knowledge of various Diffusion process

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure (New scheme)
B. Sc. Second year (Semester-IV)
Semester Pattern effectivefrom-2020
Industrial Chemistry

CCIC IV (Section B)
Pollution Monitoring & Control (P-IX)

Credits:02

Unit 1

Regulatory aspects*:* **11 Hours**

Industrial emission, liquids and gases, pollution caused by various chemical industries and its overall effect on quality of human life and environment, environmental legislation, water (prevention and control of pollution) Act 1974, Air (Prevention and control of pollution) Act 1981.

Unit 2

Pollution and its measurements: **11 Hours**

Nature of industrial effluents, gaseous and liquid effluents, methodsof gas analysis, analysis of CO, SO_2, NO_x, S, Cl_2 in the gaseous effluents. Methods of removal of pollutants from gaseous effluents, particulate matter, particle size analysis. AAS applications process for waste water.

Unit 3

Sewage and sewage Treatment: **11Hours**

Municipal waste water, important definitions, sewage and its composition, bacteriology of sewage and treatment, stabilization, properties of sewage, purpose of sewage treatment, methods of sewage treatment , method of sewage treatment, removal of phosphorous and nitrogen from waste water , filtration of sewage, types of aerobic oxidation plant, anaerobic biological oxidation plant, miscellaneous method of sewage treatment, cycle of decomposition, self-cleaning velocity, system of sewerage, analysis of sewage, sludge disposal, methods of sludge disposal, methods of sewage disposal, sewage sickness, self-purification of natural water, methods of sewage disposal, waste water and its treatment (recycling of sewage) .

Unit 4

Industrial wastes and treatment processes: **12Hours**

Introduction, the problem of sustenance and the chemical industry, characteristics of industrial wastes, types of industrial waste , solid industrial wastes , principles of industrial waste treatment , protection of biosphere, basic trends in biosphere protection for industrial wastes, protection of surface waters from pollution with industrial sewage, treatment and disposal of industrial wastes, treatment of wastes or effluents with organic impurities, treatment of wastes or effluents with inorganic impurities, effluents of industrial units and their purification, treatment of some industrial effluents, sanitary-chemical analysis of industrial effluents or sewage, the nature and treatment of some important chemical wastes .

Reference Books

1. S P Mahajan: Pollution control in process industry
2. M Sitting: Resources recovery recycling handbook and industrial waste (N D S
3.A K Dey: Environmental chemistry
4. W Handley: Industrial safety handbook
5. A.C. Stern: Air pollution: Engineering control Vol (IV) A.P.
6.Wark & Warner: Air pollution origin and control

7. S.M. Khopkar: Environmental pollution analysis
8.B.K Sharma: Industrial chemistry.

Objective (S)	To acquire basic knowledge about IndustrialPollution
Course Outcome(S)	
CO1	To learn regulatory aspects of Air pollution.
CO2	TO Explain the Various Industrial Pollution and its measurements.
CO3	To study Sewage and sewage Treatment.
CO4	To Illustrate the knowledge of **Industrial wastes and treatment processes.**

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure (New scheme)
B. Sc. Second year (Semester-IV)
Semester Pattern effectivefrom-2020
Industrial Chemistry
CCICP-II(CCIC-III& IV)
(section A)

Practical's based on P-VI&P-VIII(P-X)

Credits:02

1. To Perform a expt. on **Simple Distillation** using binary mixture (Methanol + Water orEthanol Water) & Verify the Raleigh's Equation and Calculate the Material Balance for Simple distillation.
2. To Perform a expt. on Steam**Distillation** usingTerpentine and Calculate Material Balance for Steam Distillation..
3. To Perform a experiment on **Distillation with total reflux** using Binary mixture (Methanol + Water or Ethanol+Water) and Calculate number of plates for fractionating column .
4. To study the experiment on Liquid-Liquid Extraction by using **Mixer Settler** System & Calculate Percentage of Extraction.
5. To study the Liquid-Liquid Equillibria for three component system (**Glacial Acetic Acid +Chloroform+ Distilled Water**) and Calculate the Percentage composition of each component at heterogeneous mixture
6. To Study the distribution of Iodine between Water and CCl_4
7. To study the **Rate of Drying of solid** substances (saw dust or Card Board)
8. To study the **Rate of Drying of Liquid** substances.
9. To Crystallise the given sample of Phthalic acid from hot water using fluted paper and stemless funnel.
10. To Crystallise the given sample of Benzoic acid from hot water using fluted paper and stemless funnel.
11. To purify the given sample of naphthalene or camphor by simple sublimation method.
12. To purify the given sample of Succinic acid or phthalic acid by vacuum sublimation method.
13. Determine the rate of evaporation of given liquid Sample.
14. Determination of copper in brass
15. Determination of Iron In Plain Carbon steel
16. Preparation of Lactose and Casein in from milk.
17. Preparation of Paracetamol.
18. Preparation of m- Dinitrobenzene From Nitrobenzene& Calculate % Yield.
19. Preparation of P- Nitro aniline From Aniline & Calculate % Yield.
20. Estimation of Cane Sugar.
21. Estimation of Lime in Cement.

Reference Books:

1 Unit Operations-II -K.A.Gavhane
2. Systematic Experimental Physical Chemistry – S.W.Rajbhoj&T.K.Chondhekar
3. Practical Chemistry – S. Umar, J. Sardar & A. Muley
4. University Practical Chemistry, Vishal Publishing Co.Jalandhar-P.C.Kamboj

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure (New scheme)
B. Sc. Second year (Semester-IV)
Semester Pattern effectivefrom-2020
Industrial Chemistry
CCICP-II(CCIC-III& IV)
(section-B)

Practical's based on P-VII&P-IX(P-XI)

Credits:02

1. To Study the Performance of**Plug Flow Reactor :**To study the Performance of plug flow reactor used and to calculate thereotical& practical conversion for a second order reaction between Ethyl acetate & NaOH.
2. To Study the Performance equation of **Coil Tube Reactor** : To study the Performance of plug flow reactor used and to calculate thereotical& practical conversion for a second order reaction between Ethyl acetate & NaOH.
3. To Study the **First Order Reaction**: Hydrolysis of an Ester (Methyl Acetate in presence of HCL).
4. To Study the **Zero Order Reaction**: Investigate the kinetics of Iodination of Acetone.
6. To Study the **Autocatalytic reaction**: Reaction between Potassium Permangnate& Oxalic acid.
7. To Study the Rate of reacation (r_A) between Ethyl bromo acetate & Sodium thiosulphate kinetically using **Batch Reactor.**
8. To determine the Order of reaction (n) of given reaction Kinetics by using **Substitution method, Fractional change method and Differential method.**
9. To determine the Rate Constant (K) of the reaction between Potassium Persulphate& Potassium Iodide having equal concentration of reacting species (a=b) by using **Mixed Reactor.**
10. To determine the Rate Constant (K) of the reaction between Potassium Persulphate& Potassium Iodide having un equal concentration of reacting species (a≠b) by using **Mixed Reactor.**
11. To determine rate constant (K) of the reaction between Bromic acid and Hydroiodic acid having equal concentration of reacting species (a=b) using **Batch reactor**.
12. To determine the **Energy of Activation (E_a)** of hydrolysis of Ethyl acetate in prewence of NaOH.
13. To determine the **Energy of Activation (E_a)** of the reaction pbtween Potassium Persulphate& Potassium Iodide.
14. To Determine The Rate Constant of Decomposition of H_2o_2 In Presence of acidified KI solution
15. Determination of fluoride in given water sample.
16. Determination of Sodium, Potassium, Cadmium in given water sample.

Reference Books:

1. Chemical Reaction Engineering -K.A.Gavhane
2. Systematic Experimental Physical Chemistry – S.W.Rajbhoj&T.K.Chondhekar
3. University Practical Chemistry, Vishal Publishing Co.Jalandhar-P.C.Kamboj

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure (New scheme)

B. Sc. Second year (Semester-III)
Semester Pattern effectivefrom-2020
Industrial Chemistry
CCICP-II(CCIC-III&IV),
(section A)
(section-A)SEC IStoichiometric Aspect of Unit Operations

1. Distillation.
2. Gas Absorption
3. Crystallization.
4. Extraction & Leaching
5. Humidification
6. Solved problems

Reference Books:

1.Stoichiometry - K.A.Gavhane
2University Practical Chemistry, Vishal Publishing Co.Jalandhar-P.C.Kamboj

OR

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure (New scheme)
B. Sc. Second year (Semester-III)
Semester Pattern effectivefrom-2020
Industrial Chemistry
CCICP-II(CCIC-III&IV),
(section-A)SEC IAir analysis

Introduction
Study of Spectrometre
Steady of Respirable Dust Sampler Machine
Monitoring of Rspm(Pm 10)
Monitoring of SO2
Monitoring of NOx
Monitoring and study of Industrial Area, Residential Area,ComercialArea.
Preparation of report

Reference Books:

1. S P Mahajan: Pollution control in process industry
2. M Sitting: Resources recovery recycling handbook and industrial waste (N D S
3.A K Dey: Environmental chemistry
4. W Handley: Industrial safety handbook
5. A.C. Stern: Air pollution: Engineering control Vol (IV) A.P.
6.Wark & Warner: Air pollution origin and control
7. S.M. Khopkar: Environmental pollution analysis

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure (New scheme)
B. Sc. Second year (Semester-IV)
Semester Pattern effectivefrom-2020
Industrial Chemistry
CCICP-III (CCIC-III &IV),
(**section B**)

(SEC II-Introduction to manufacturing process chemical treatment.

1. Coke oven gas plus derived NH_3 synthesis.
2. Natural gas and LPG treatment processes.
3. Synthesis of poly vinyl chloride from vinyl chloride.
4. Manufacture of Soda Ash by Solvay Process.
5. Hydrogenation of Vegetable Oil.
6. Urea from ammonium carbamate.
7. Paper making Process.
8. Extraction of Sucrose from sugar cane
9. Portland cement manufacturing process.
10. Manufacturing process Ethyl Alcohol by Fermentation.

Reference Books:

1.Drydens Outline of Chemical Technology- Gopal rao
2.Experimental engineering chemistry -S. S Dara.

OR

Swami Ramanand Teerth Marathwada University Nanded
Choice Based Credit System (CBCS) Course Structure (New scheme)
B. Sc. Second year (Semester-IV)
Semester Pattern effectivefrom-2020
Industrial Chemistry
CCICP-III (CCIC-III &IV),
(**section B**)
(SEC II -Introduction to manufacturing process chemical treatment.)

1. Synthesis of dyes Indigoid.
2. Synthesis of dyes OrangeII
3. Synthesis of dyes Congo-Red
4. Synthesis of dyes Rosanthrene O
5. Synthesis of PolyStyrene from Styrene.
    a) Calendering Method.
    b) Spreading Method.
6. Manufacturing process Toilet Soap.
7. Manufacturing process Shaving Soap.
8. Manufacturing process Shampoos.
9. Manufacturing process Mosquito Coil from plants.
10. Manufacturing process Cough syrup.
11. Manufacturing process Burn Ointment.
12. Manufacturing process Oriental Balm.
13. Manufacturing process Nylon 6,6
14. Manufacturing Process of Hand Sanitizers

Reference Books:

1.Drydens Outline of Chemical Tecnology- Gopal rao.
2) M.G Arora.
3)R.K. Malik&V.K.Aggrawal.
4) Anaiytical chemistry -Gurudeep R Chatwal.
5) Manufacturing of Phermasuitical drug &Fine Chemical - D.C Gupta.
6) Experimental engineering chemistry -S. S Dara.