॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with'B++' grade

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरण २०२० नुसार पदवी द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २७ मे २०२५ रोजी संपन्न झालेल्या मा. विद्यापरिषद बैठकीतील विषय क्रमांक १६/६१–२०२५ च्या ठरावानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील राष्ट्रीय शैक्षणिक धोरण–२०२० नुसारचे पदवी द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्यास मा. विद्यापरिषदेने मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील बी. एस्सी द्वितीय वर्षाचे खालील विषयाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्यात येत आहेत.

01	B.Sc. Agriculture Microbiology	11	B.Sc. Physics
02	B.Sc. Botany	12	B.Sc. Seed Technology
03	B.Sc. Dairy Science	13	B.Sc. Horticulture
04	B.Sc. Electronics	14	B.Sc. Statistics
05	B.Sc. Environmental Science	15	B.Sc. Biochemistry
06	B.Sc. Fishery Science	16	B.Sc. Analytical Chemistry
07	B.Sc. Food Science	17	B.Sc. Agrochemical & Fertilizers
08	B.Sc. Geology	18	B.Sc. Industrial Chemistry
09	B.Sc./B.A. Mathematics	19	B.Sc. Industrial Microbiology
10	B.Sc. Microbiology		

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

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शै–१/एनइपी/विवत्रंविपदवी/२०२५–२६/११६
दिनांक ०५.०६.२०२५

सहाय्यक कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत : माहितीस्तव तथा कार्यवाहीस्तव.

१) मा. कुलगुरू महोदयांचे कार्यलय, प्रस्तुत विद्यापीठ.
२) मा. प्र. कुलगुरू महोदयांचे कार्यलय, प्रस्तुत विद्यापीठ.
३) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
४) मा. संचालक, परीक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
५) मा. प्राचार्य, सर्व संबधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
६) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, परिपत्रक अभ्यासक्रम संकेतस्थळावर प्रसिध्द करण्यात यावेत.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED - 431 606

(Credit Framework and Structure of Four Year UG Program with Multiple Entry and Exit Option as per NEP-2020)

UNDERGRADUATE PROGRAMME OF SCIENCE & TECHNOLOGY

B.Sc. Second Year

SUBJECT – Industrial Chemistry

Major in DSC and Minor in DSM (Subject)

Under the Faculty of Science & Technology

(Revised as per the Govt. Of Maharashtra circular dt. 13th March 2024)

With effect from June 2025

Effective from the Academic Year 2025 – 2026
(As per NEP-2020)

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

UNDERGRADUATE PROGRAMME

Subject: Industrial Chemistry

Course pre-requisite:

At its core, the National Education Policy 2020 envisions an educational framework that is learner-centric, multidisciplinary, and geared towards fostering creativity, critical thinking, and innovation. It emphasizes the integration of knowledge across disciplines, breaking down traditional silos to encourage holistic understanding and application of concepts. The Bachelor of Science (B. Sc.) curriculum embodies these principles by offering a diverse array of courses spanning various scientific domains, while also incorporating interdisciplinary studies to nurture well-rounded graduates capable of addressing complex challenges with agility and insight. Furthermore, the curriculum is designed to promote experiential learning, research, and hands-on exploration, recognizing the importance of practical engagement in deepening understanding and cultivating real-world skills. Through laboratory work, field experiences, internships, and project-based learning opportunities, students will have the chance to apply theoretical knowledge in practical settings, develop problem-solving abilities, and cultivate a spirit of inquiry and discovery.

Course objectives:

The students of subject Industrial Chemistry are catering to the needs of the industrial manpower in the region. The revised syllabus of B.Sc. Second year has been designed with well-defined objectives

1. This course is specially designed to keep view on needs of academics & Industrial requirements.

2. This will provide employment in various Industries. Such as Sugar, Metallurgy, Cement, Petroleum, Chemical, Polymer, Pharmaceutical, Drug and Dyes etc.

3. Student will get all types of knowledge regarding Industrial manufacturing process of commercial product & its required instruments.

4. This course also offer ample skill to pursue research as a career in the field of Chemistry & allied area with industrial development.

5. The student will improve ability to work on their own interest to start-up small scale industries.

Course outcomes:

1. The students will develop self confidence.

2. Students will get aware about Industrial process, Industrial pollution & Industrial safety.

3. It will enable student to compete NET, SET, UPSC, MPSC, GATE and other competitive examinations.

4. This course enhances student to prepare for upcoming challenges and make our country self-reliant.

5. It will provide opportunities to access other universities or state.

6. This will develop scientific attitude in students to make them creative, critical and curious.

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science & Technology

Subject: Industrial Chemistry

B.Sc. Second Year Semester III (Level 5.0)

Teaching Scheme

Subject	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	SICCT1201	Unit Operation I	02	--	**02**	02	--
	SICCP1201	Practical based on SICCT1201	--	02	**02**	--	04
	SICCT1202	Chemical Reaction Engineering-I	02	--	**02**	02	--
	SICCP1202	Practical based on SICCT1202	--	02	**02**	--	04
Minor	SICCMT1201	Industrial Process -I	02	--	**02**	02	--
	SICCMP1201	Practical based on SICCMT1201	--	02	**02**	--	04
Generic Electives *(from other Faculty)*	SICCGE1201	Environmental Chemistry-I	02	--	**02**	02	--
Skill Based Course (related to Major)	SICCSC1201	Distillation & Crystallization-I	--	02	**02**	--	04
Total Credits			**08**	**08**	**16**	**08**	**16**

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science & Technology

Subject: Industrial Chemistry

B.Sc. Second Year Semester III (Level 5.0)

Examination Scheme

Subject	Course Code	Course Name	Theory				Practical		Total Col (6+7)/ Col (8+9)
			Continuous Assessment (CA)			ESA			
			Test 1	Test 2	Average of T1 & T2	Total	CA	ESA	
01	*02*	*03*	**04**	**05**	**06**	**07**	**08**	**09**	**10**
Major	SICCT1201	Unit Operation -I	10	10	10	**40**	--	--	**50**
	SICCP1201	Practical based on SICCT1201	--	--	--	--	20	30	**50**
	SICCT1202	Chemical Reaction Engineering-I	10	10	10	**40**	--	--	**50**
	SICCP1202	Practical based on SICCT1202	--	--	--	--	20	30	**50**
Minor	SICCMT1201	Industrial Process -I	10	10	10	**40**	--	--	**50**
	SICCMP1201	Practical based on SICCMT1201	--	--	--	--	20	30	**50**
Generic Electives *(from other Faculty)*	SICCGE1201	Environmental Chemistry-I	10	10	10	**40**	--	--	**50**
Skill Based Course (related to Major)	SICCSC1201	Distillation & Crystallization-I	--	--	--	--	20	30	**50**
									400

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science & Technology

Subject: Industrial Chemistry

B.Sc. Second Year Semester IV (Level 5.0)

Teaching Scheme

Subject	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	SICCT1251	Unit Operation- II	02	--	**02**	02	--
	SICCP1251	Practical based on SICCT1251	--	02	**02**	--	04
	SICCT1252	Chemical Reaction Engineering-II	02	--	**02**	02	--
	SICCP1252	Practical based on SICCT1252	--	02	**02**	--	04
Minor	SICCMT1251	Industrial Process -II	02	--	**02**	02	--
	SICCMP1251	Practical based on SICMT1251	--	02	**02**	--	04
Generic Electives *(from other Faculty)*	SICCGE1251	Pollution Monitoring & Control	02	--	**02**	02	--
Skill Based Course (related to Major)	SICVC1251	Polymer Resin & Plastics	--	02	**02**	--	04
Total Credits			**08**	**08**	**16**	**08**	**16**

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science & Technology

Subject: Industrial Chemistry

B.Sc. Second Year Semester III (Level 5.0)

Examination Scheme

Subject	Course Code	Course Name	Theory				Practical		Total Col (6+7)/ Col (8+9)
			Continuous Assessment (CA)			ESA			
			Test 1	Test 2	Average of T1 & T2	Total	CA	ESA	
01	*02*	*03*	**04**	**05**	**06**	**07**	**08**	**09**	**10**
Major	SICCT1251	Unit Operation- II	10	10	10	**40**	--	--	**50**
	SICCP1251	Practical based on SICCT1251	--	--	--	--	20	30	**50**
	SICCT1252	Chemical Reaction Engineering-II	10	10	10	**40**	--	--	**50**
	SICCP1252	Practical based on SICCT1252	--	--	--	--	20	30	**50**
Minor	SICMT1251	Industrial Process -II	10	10	10	**40**	--	--	**50**
	SICMP1251	Practical based on SICMT1251	--	--	--	--	20	30	**50**
Generic Electives *(from other Faculty)*	SICGE1251	Pollution Monitoring & Control	10	10	10	**40**	--	--	**50**
Skill Based Course (related to Major)	SICVC1251	Polymer Resin & Plastics	--	--	--	--	20	30	**50**
									400

SWAMI RAMANAND TEERTH
MARATHWADA UNIVERSITY, NANDED - 431
606 (MS)

Faculty of Science and Technology

Syllabus

(*As Per NEP- 2020*)

Subject: Industrial Chemistry

B. Sc. Second Year

Semester – III

To be Implemented from

Academic Year 2025-2026

National Education Policy 2020

B.Sc. Industrial Chemistry II Year (Semester - III) Major Core Theory Course

Course Code – SICCT1201

Title of the Course: Unit Operation I

[Credits: 2 (Marks: 50)] **(Total Periods: 30 Hours)**

CURRICULUM DETAILS: SICCT1201: Unit Operation I

Module No.	Unit No.	Topic	Hrs.
1.0		**Overview of Mass Transfer Operations**	**07**
	1.1	Introduction to Mass Transfer operations,	
	1.2	Benefits, General Principles of Mass Transfer,	
	1.3	Importance & Classification of Mass Transfer Operations	
2.0		**Distillation- ,**	**08**
	2.1	Introduction, Flash Distillation, Simple Distillation, Steam Distillation, Rectification, Material Balances in Plate Columns, Number of Ideal Plates	
	2.2	McCabe Thiele Method, Constant molal overflow. Reflux Ratio, Condenser and Top Plate, Bottom Plate and Reboiler, Feed Plate,	
	2.3	Minimum Reflux, Optimum Reflux Ratio,PlateEfficiency,Types, Relations,	
	2.4	Factors influencing plate efficiency, Rectification in packed towers, Batch distillation	
3.0		**Liquid Extraction**	**07**
	3.1	Terminology, Introduction to liquid-liquid extraction, Applications of Liquid-Liquid Extraction, Principles of liquid-liquid equilibria, Triangular diagrams, Types of extraction system, I & II,	
	3.2	Temperature effects on systems types, Solvent selection, Commercial extraction system	
	3.3	Typical extraction system, Extraction Calculations-Single Stage Operations, Multi Stage Cross Current Operation,	

	3.4	Continuous multistage counter current operations	
4.0		**Crystallization**	**08**
	4.1	Importance of Crystal Size, Crystal Geography, Crystallographic systems, Invariant Crystals, Principles of Crystallization, Purity of Product, Equilibria& its yields, Enthalpy Balances, Super Saturation	
	4.2	Units of Super Saturation, Temperature differential as a potential, Nucleation-Origins of Crystals in crystallizers,	
	4.3	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,	
	4.4	ΔL law of crystal growth, Crystallization Equipment-variations in crystallizers, Vacuum Crystallizers, Draft Tube Baffle Crystallizer, Yield of Vacuum Crystallizer,numericals.	
		Total	**30**

Text Books and Reference Books:

Reference Books:

1. Unit Operations-II -K.A.Gavhane
2. Unit operation by Mccabe and Smith

National Education Policy 2020

B.Sc. II Year (Semester - III) Major Practical Course

Course Code – SICCP1201

Title of the Course: Practical based on SICCT1201

[Credits: 2 (Marks: 50)] **(Total Periods: 60 Hours)**

CURRICULUM DETAILS: SICCP1201: Practical based on SICCT1201

Sr. No.	Practical Exercises	Hrs.
1.	To Perform a experiment on **Simple Distillation** using binary mixture *(Methanol +water or Ethanol+Water)* & Verify the Rayleigh's Equation. Calculate the Material Balance for binary mixtures and find The composition of the distillate & the residue.	4
2.	To Perform aexperiment on **Steam Distillation** using *Turpentine* Or *Nitrobenzene* and Calculate Material Balance for Steam Distillation ..	4
3.	To Perform a experiment on **Distillation with total reflux**using Binary mixture (*Methanol+Water or Ethanol+Water)* and Determine theoretical plates byMcCabe-Thiele Method.	4
4.	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.	4
5.	To Separate various types of Organic compounds by control of the P^H of the ectraction medium	4
6.	Preparation of Lactose and Casein in from milk.	4
7.	Preparation of m- Dinitrobenzene From Nitrobenzene& Calculate % Yield.	4
8.	To Crystallise the given sample of Phthalic acid from hot water using fluted paper and stemless funnel.	4
9.	preparation of Paracetamol.	4
10.	To purify the given sample of naphthalene or camphor by simple sublimation method.	4
11.	Determination of copper in brass	4
12.	Determination of Iron In Plain Carbon steel	4
13.	Preparation of P- Nitro aniline From Aniline & Calculate % Yield.	4
14.	Estimation of Lime in Cement.	4
15.	Estimation of Cane Sugar.	4
	Total	**60**

Text Books and Reference Books:

Reference Books:

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

National Education Policy 2020

B.Sc. Industrial Chemistry, II Year (Semester - III)

Major Core Theory Course

Course Code – SICCT1202

Title of the Course: Chemical Reaction Engineering I

[Credits: 2 (Marks: 50)] **(Total Periods: 30 Hours)**

CURRICULUM DETAILS: SICCT1202: Chemical Reaction Engineering I

Module No.	Unit No.	Topic	Hrs.
1.0		**Ovierview of Chemical Reaction**	**04**
	1.1	Typical Chemical Process, .	
	1.2	Classification of reactions,	
	1.3	Variable affecting the Rate of Reaction	
	1.4	Definition of Reaction Rate the rate equation	
2.0		**Kinetics of Homogeneous Reactions**	**10**
	2.1	Concentration-Dependent Term of a rate equation, Single & multiple Reactions, Elementary & Nonelementary reactions	
	2.2	Molecularity & Order of Reaction, Rate Constam(K). Representation of an Elementary Reaction, Representation of Non elementary Reaction, Kinetic Models for Non elementary Reactions-free radicals,	
	2.3	Transition Complex, Non Chain Reactions, Chain Reactions-Free radicals,	
	2.4	Chain reaction mechanism, Molecular intermediates, nonchain mechanism, Transition Complex Temperature Dependency from Arrhenius Law. Comparison of Theories with Arrhenius law, Activation Energy and Temperature Dependency,	
3.0		**Interpretation of Batch Reactor Data**	**10**
	3.1	Introduction of Batch Reactor.Constant-Volume Batch Reactor,Analysis of Total Pressure data obtained in a Constant-Volume System,	
	3.2	Integral Method of Analysis of Data, Irreversible Unimolecular-type First Order Reactions,	
	3.3	Reversible Bimolecular-Type Second Order Reactions, Zero Order Reactions, Overall Order of Irreversible Reactions from the half-Life t1/2, Irreversible reactions in Parallel,	
	3.4	Autocatalytic Reactions, Irreversible Reactions in Series.	
4.0		**Design of single ideal reactors**	
	4.1	Chemical reactor, batch reactor	

	4.2	Semi batch reactor , continuous reactors,	**06**
	4.3	Tank reactors, tubular reactor,	
	4.4	fixed-bed reactors, fluidized-bed reactor, material balance over an element of reactor volume,	
		Total	**30**

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

National Education Policy 2020

B.Sc. II Year (Semester - III) Major Practical Course

Course Code – SICCP1202

Title of the Course: Practical based on SICCT1202

[Credits: 2 (Marks: 50)] (Total Periods: 60 Hours)

CURRICULUM DETAILS: SICCP1202: Practical based on SICCT1202

Sr. No.	1. Practical Exercises	Hrs.
1.	Investigate the kinetics of Iodination of Acetone.	4
2.	To Study the **First Order Reaction**: Hydrolysis of an Ester (Methyl Acetate in presence of HCL).	4
3.	To Study the Hydrolysis of an Ethyl Acetate in Presence of Sodium Hydroxide.	4
4.	Investigate the influence of Ionic Strength of on the rate constant between potassium persulphate and Potassium iodide.	4
5.	Determine energy of activation of the reaction between potassium persulphate and Potassium iodide.	4
6.	Determine rate constant of the reaction between potassium persulphate and potassiom iodide having equal concentrations of the reacting species (a=b)	4
7.	Investigate the auto- catalytic reaction between Potassium Permangnate& Oxalic acid.	4
8.	Investigate the reaction between hydrogen peroxide and potassium iodide kinetically	4
9.	Study the rate of reaction between ethyl bromo -acetate and sodium thiosulphate kinetically.	4
10.	Investigate the reaction between bromic acid and hydroiodic acid.	4
11.	Determine the order of reaction of a given reaction kinetics by Substitution Method.	4
12.	Determine the partition coificient of iodine between carbon tetra chloride & water.	4
13.	Determine the solubility of Benzoic acid in water at different Temperature & hence Heat of Solution.	4

14.	Determine heat of Neutralization of HCl by NAOH	4
15.	Industrial Visit	4
	Total	**60**

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

National Education Policy 2020

B.Sc. Industrial Chemistry II Year (Semester - III) Minor Course (Theory)

Course Code – SICMT1201

Title of the Course: Industrial Process-I

[Credits: 2 (Marks: 50)] **(Total Periods: 30 Hours)**

CURRICULUM DETAILS: SICMT1201: Industrial Process-I

Module No.	Unit No.	Topic	Hrs.
1.0		**Introduction History & Properties**	**07**
	1.1	Sulpher & Sulphuric Acid	
	1.2	Sugar & Ethyl Alcohol	
	1.3	Cement & Lime	
	1.4	Soda ash &caustic soda	
2.0		**Raw materials & methods of Productions**	**08**
	2.1	Sulpher & Sulphuric Acid	
	2.2	Sugar & Ethyl Alcohol	
	2.3	Cement & Lime	
	2.4	Soda ash &caustic soda	
3.0		**Manufacturing Process Description and Flow Sheet**	**07**
	3.1	Sulpher & Sulphuric Acid	
	3.2	Sugar & Ethyl Alcohol	
	3.3	Cement & Lime	
	3.4	Soda ash &caustic soda	
4.0		**Outline of Material Balance plant Lay Out And Plant Utility**	**08**
	4.1	Sulpher & Sulphuric Acid	
	4.2	Sugar & Ethyl Alcohol	
	4.3	Cement & Lime	
	4.4	Soda ash &caustic soda	
		Total	**30**

Reference Books:

1. Comprensive Industrial Chemistry By Prakash G More
2. Industrial Chemistry By B.K.Sharma
3. Dryden Outline of Chemical Technology By M.Gopala Raw
4. Industrial Chemistry By Clerk Renka
5. Small Medium and Large Scale Chemical Indusries By Sudhir Gupta

National Education Policy 2020

B.Sc. Industrial Chemistry II Year (Semester - III) Minor

Practical Course

Course Code – SICMP1201

Title of the Course: Practical based on SICMT1201

[Credits: 2 (Marks: 50)] **(Total Periods: 60 Hours)**

CURRICULUM DETAILS: SICMP1201: Practical based on SICCMT1201

Sr. No	Practical Exercises	Hrs.
1.	Preparation of Nitro Benzene from Benzene	4
2.	Preparation of Sulphanilic Acid From Aniline	4
3.	Preparation of Picric Acid From Phenol.	4
4.	Preparation sodium benzene sulphonate from Benzene.	4
5.	Preparation of Cyclohexenone oxime from Cyclohexenone.	4
6.	Preparation of M-Nitro Aniline From M-dinitro aniline	4
7.	Preparation of Anthranalic acid from Pthalamide	4
8.	Synthesis of P-Chloro Tolune From P- Tolidine.	4
9.	Determination of total potassium content of muriate of potash (flame photometer).	4
10.	Determination of zinc content from micronutrient fertilizer (EDTA Method).	4
11.	Estimation Of Glucose in Unknown Glucose Sample	4
12.	Determination of Total quantity of Calcium in Dolomite	4
13.	Determination of Total quantity of Magnecium in Dolomite	4
14.	Determination of Lime in Cement	4
15.	Visit to Chemical industry and study of their activities	4
	Total	**60**

Text Books and Reference Books:

1. Practical Organic Chemistry by Dr. Vinay Prabha Sharma.
2. Advanced Practical Chemistry By R Mukhopadhyay & P.Chatarjee
3. Experiments and Calculations in Engineering Chemistry By Dr. S.S.Dara
4. Vogel -practical organic chemistry 5th edition.

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National Education Policy 2020

B.Sc. II Year (Semester - III) Generic Elective Course

Course Code – SICGE1201

Title of the Course: Environmental Chemistry-1

[No. of Credits: 2 Credit] **[Total: 30 Hours]**

Curriculum Details: SICCGE 1201: Environmental chemistry-I

Module No.	Unit No.	Topic Environmental Chemistry-1	Hrs.
1.0		**Introduction- Environment - ,**	**08**
	1.1	Man Interferes with the Environment, Components of Environment, Factors affecting Environment, Man and Environment,	
	1.2	Types of Environment, Environmental Management, Objectives of Environment and Management,	
	1.3	Components of Environmental Management, Environmental Education-Objectives of Environmental Education	
	1.4	Principles of Environmental Education.	
2.0		**Concept of Environmental Chemistry-**	**07**
	2.1	Segments of Environment-	
	2.2	Hydrosphere-Solubility ofGases in Water, Hydrological (Water) Cycle. Ocean Currents.	
	2.3	Lithosphere-Three kinds of soil forming rocks, Process of Soil Formation, important characteristics of Sandy soil, Clay soil and Loam soil.	
	2.4	Biosphere- Environmental Pollution , what is pollution,	
3.0		**Biogeochemical Cycles in Environment –**	**07**
	3.1	Sulphur Cycle	
	3.2	Phosphorus Cycle	

	3.3	Carbon Hydrogen Cycle	
	3.4	Oxygen Cycle	
4.0		**Pollution**	**08**

	4.1	Water	
	4.2	Air	
	4.3	Sound	
	4.4	Soil	

Text Books and Reference Books:

Reference Books:

1. Environmental Chemistry-B.K.Sharma
2. Industrial chemistry by B.K Sharma

National Education Policy 2020

B.Sc. Industrial Chemistry II Year (Semester - III) Skill Enhancement Course

Course Code – SICCSC1201

Title of the Course: Distillation & Crystallization

[No. of Credits: 2 Credit] **[Total: 60 Hours]**

CURRICULUM DETAILS: SICCSC1101: Distillation & Crystallization

a) Theory: **20 Hrs.**

i. Introduction to Distillation & Study of Distillery industry.
ii. Introduction to Crystallization& Study on Chemical Industry.

b) Practicals:

Sr. No.	Practical Exercises	Hrs. Required
1.	Perform Simple Distillation using Binary Mixture using Methanol & Water& Verify Raylaigh Equation	4
2	Perform Simple Distillation using Binary Mixture using Methanol & Water& Verify Raylaigh Equation	4
3.	Steam Distillation using Tupentine & Calculate Material Balance	4
4.	To Perform Experiment on Steam Distillation using Nitro Benzene& Calculate Material Balance.	4
5.	Crystallization Process To Crystallize The Naphthalene & Anthracene	4
6.	To Crystallize the Succinic acid and Cinnamic acid	4
7.	To Crystallize the Benzoic acic & Picric acid	4
8.	Study on Fermentation of Sugar	4
9	Perform the experiment on Distillation with Total Reflux Using Binary Mixture & Determine Theoretical plates By Mc Cabe Thiele Method	4

10	Visit to Distillery industry	4
	Total	**40**

Text Books and Reference Books:

TextBooks:

1. UnitOperations-II-K.A.Gavhane
2. Systematic ExperimentalPhysicalChemistry-S.W.Rajbhoj- T.K.Chondhekar
3. PracticalChemistry-S.Umar, J,Sardar&A.Muley
4. Experiments and Calculations in Engineering Chemistry- S.S.Dara.
5. Experimental IndustrialChemistry - P.S.Mane

SWAMI RAMANAND TEERTH
MARATHWADA UNIVERSITY, NANDED - 431
606 (MS)

Faculty of Science and Technology

Syllabus

(*As Per NEP- 2020*)

Subject: Industrial Chemistry

B. Sc. Second Year

Semester – IV

To be Implemented from

Academic Year 2025-2026

National Education Policy 2020

B.Sc. Industrial Chemistry II Year (Semester - IV) Major

Core Theory Course

Course Code – SICCT1251

Title of the Course: Unit Operation II

[Credits: 2 (Marks: 50)] **(Total Periods: 30 Hours)**

CURRICULUM DETAILS: SICCT1251: Unit Operation II

Module No.	Unit No.	Topic	Hrs.
1.0		**Evaporation**	**07**
	1.1	Introduction, Liquid Characteristics, Types of Evaporators, Performance of Tubular Evaporators, Evaporator Capacity, Boiling Point Elevation and Duhring Rule,	
	1.2	Effect of liquid head & friction on temperature drop, Heat Transfer Coefficient, Overall Coefficient,	
	1.3	Evaporator economy, Enthalpy balance for single effect evaporator, Enthalpy balance with negligible heat of dilution,	
	1.4	Single effect calculations, Multiple effect evaporators, Methods of feeding, Capacity and economy of multiple effect evaporator,Effect of liquid head and boiling point elevation numerical.	
2.0		**Drying of Solids**	**08**
	2.1	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,	
	2.2	Bound & unbound water, Cross circulating drying-constant drying conditions, Rate of drying,	
	2.3	Constant rate period, Critical Moisture Content & Falling Rate Period,	
	2.4	Drying Equipments-Dryers for Solids & Pastes, Dryers for Solutions & Slurries.numericals.	
3.0		**Diffusion**	

	3.1	Introduction, Defination, Mechanism(Ficks Law) ,Molecular diffusion in gases and liquids, steady state diffusion of A through non-diffsingB,	**08**
	3.2	steady state equimolar counter diffusion, analogy of film theory in mass transfer with that in heat transfer, film theory,	
	3.3	surface renewal, penetration,theory,equilibrium,diffusion between phases,	
	3.4	material balances of co-current and counter-current, numericals.	
4.0		**Gas Absorption**	**07**
	4.1	Introduction, Design of Packed Towers, Contact between Liquid & Gas, Pressure drop & limiting flow rates,	
	4.2	Principles of absorption material balances, Limiting gas-liquid ratio,	
	4.3	Temperature variations in packed towers, Rate of absorption,	
	4.4	Calculation of tower height, Number of Transfer units,numericals.	
		Total	**30**

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, Mee

National Education Policy 2020

B.Sc. II Year (Semester -IV) Major Practical Course

Course Code – SICCP1251

Title of the Course: Practical based on SICCP 1251

[No. of Credits: 2 Credit] **[Total: 60 Hours]**

CURRICULUM DETAILS: SICCP 1251: Practical based on SICCT 1151

Sr. No.	Practical Exercise	Hrs.
1	To study the **Rate of Drying** of solid substances (Saw*dust or CardBoard)*	4
2	To study the-rate of Drying/ Evaporation of Liquid substances.	4
3	To study the rate of drying in **Tray Dryer**.	4
4	Estimation of Ferrous and Ferric Iron in the Given solutions	4
5	Determination of Copper in Given Solutions	4
6	Determination of Nickel in Given Solutions	4
7	Determnation of Chromium in Chromite ore	4
8	Determination of Iron in Plain carbon steel	4
9	Preperation of P- Chloro Benzoic Acid	4
10	Preperation of P- Chloro Benzil	4
11	Preper of Methyl Orange	4
12	Preperation of Benzene -azo-Beta Napthol	4
13	Preperation of p-Nitro Aniline	4
14	Preperation of Benzoic acid	4
15	Visit to Chemical Industry	4
	Total	**60**

Text Books and Reference Books:

1. Advanced Practicl Chemistry By R.Mukhopadhyay
2. Practical Organic Chemistry By Dr. Vinay Prabha Sharma
3. Textbook of Practical Organic Chemistry by Vogals

National Education Policy 2020

B.Sc. II Year (Semester - IV) Major Core Theory Course

Course Code – SICCT1252

Title of the Course: Chemical Reaction engineering II

[Credits: 2 (Marks: 50)] **(Total Periods: 30 Hours)**

CURRICULUM DETAILS: SICCT1252: Chemical Reaction engineering- II

Module No.	Unit No.	Topic	Hrs.
1.0		**Introduction to Reactor Design**	**07**
	1.1	Broad Classification of Reactor and Types	
	1.2	Material Balance	
	1.3	Energy Balance	
	1.4	Rate of Reactions	
2.0		**Ideal Reactors for a Single Reaction.**	**08**
	2.1	Material balance of Volume of the reactor.	
	2.2	Energy balance for an element of Volume, Ideal Batch Reactor,	
	2.3	Space Time & Space Velocity, Steady State Mixed Flow Reactor,	
	2.4	Steady State Plug Flow Reactor, Holding Time & Space Time for flow reactors.	
3.0		**Design for Single Reactions -**	**07**
	3.1	Size Comparison of Single Reactors, Batch Reactor, Mixed versus Plug flow Reactors, First & Second Order Reactions.	
	3.2	Multiple- Reactor Systems-Plug flow reactors in series	
	3.3	First Order Reaction, Mixed Flow Reactors of Different sizes in Series, finding the conversion in a given system,	
	3.4	Determining the Best System for a given conversion	

4.0		**Design for Parallel Reactions & Basics of Non-Ideal Flow -**	**08**
	4.1	Introduction to Multiple Reactions-Qualitative Discussions about Product Distribution .	
	4.2	The Residence Time Distribution (RTD)	
	4.3	The Age Distribution of Fluid, Relation among F,	
	4.4	C and E curve and 'mean time' for closed vessel.	
		Total	**30**

***TextBooks**:*

1. UnitOperations of Chemical Engineering- W.L.McCabe, J.C.Smith, PierHarriott
2. MassTransferOperations,Robben E.Treybal
3. Chemical reaction engineering by K.A Gavhane

National Education Policy 2020

B.Sc. II Year (Semester - IV) Major Practical Course

Course Code – SICCP1252

Title of the Course: Practical based on SICCT1252

[Credits: 2 (Marks: 50)] **(Total Periods: 60 Hours)**

CURRICULUM DETAILS: SICCP1252: Practical based on SICCT1252

Sr. No	Practical Exercises	Hrs.
1.	To study the Performance of Batch Reactor :To study the Saponification of Ethylacetate with NaOH in order to dctermine Order of reaction (n) & Rate constant (K) using Batch reactor.	4
2.	To study the Performance of Plug Flow Reactor (PFR): To study the Performance of plug now reactor used and to calculate thereotical & practical conversion for a second order reaction between Ethyl acetate & NaOH	4
3.	To find out Residence time distribution in Plug Flow Reactor or Tubular reactor.	4
4.	To study the Performance equation of Coil Tube Reactor (CTR): To study the Performance of coil tube reactor for second order reaction between Ethyl acetate & NaOH.	4
5.	Study of the Kinetics of Saponification of Ester by Conductometric Method.	4
6.	To Determine The Molecular Weight of Volatile Liquid by Victor Mayers Method.	4
7.	Determine Viscosity of Liquid by OStwald Viscometer.	4
8.	To Determine the Rate Constant of Decomposition of Hydogen Peroxide on presence of Acidified KI Solutions using clock reaction.	4
9.	Determine the PH of Supplied Buffer Solution by Colour Matching Method.	4
10.	To Study of Kinetics of Reaction $I^- + S_2O_8^{2-}$ by colorimetric method.	4
11.	To study the Rate of reacation (rA) between Ethylbromoacetate&Sodium thiosulphate kinetically using Batch Reactor.	4
12.	To-determine the Order of reaction (n) of given reaction Kinetics by using Fractional change method or Differential method,	4
13.	To Test the Validity of Lambart Beers law for Pottasium per Magnate /Pottassium Dichromate solution & hence determine concentration of given solutions of substance.	4
14.	To Determine the solubility Product of Sparingly Soluble Salt by Titrimatric Method.	4
15.	Industrial Visit to Chemical Industry	4

	Total	**60**

Reference Books:

1. Advanced Practical Chemistry By R.Mukhopadhay P.Chatarjee.
2. Systematic Experimental PhysicalChemistry-S.W.Rajbhoj& T.K.Chondhekar
3. Experiments In Chemistry by D.V.Jahagirdar

National Education Policy 2020

B.Sc. II Year (Semester - IV)

Minor Course (Theory)

Course Code – SICCMT1251

Title of the Course: Industrial process-II

[Credits: 2 (Marks: 50)] **(Total Periods: 30 Hours)**

CURRICULUM DETAILS: SICCMT1251: Industrial process- II

Module No.	Unit No.	Topic	Hrs.
1.0		**Introduction History & Properties**	**07**
	1.1	Ammonia & Urea	
	1.2	Nitric Acid & Acetic acid	
	1.3	Edible &Essential Oils	
	1.4	Soap & Detergent	
2.0		**Raw materials & methods of Productions**	**08**
	2.1	Ammonia & Urea	
	2.2	Nitric Acid & Acetic acid	
	2.3	Edible &Essential Oils	
	2.4	Soap & Detergent	
3.0		**Manufacturing Process Description and Flow Sheet**	**07**
	3.1	Ammonia & Urea	
	3.2	Nitric Acid & Acetic acid	
	3.3	Edible &Essential Oils	
	3.4	Soap & Detergent	
4.0		**Outline of Material Balance plant Lay Out And Plant Utility**	**08**
	4.1	Ammonia & Urea	
	4.2	Nitric Acid & Acetic acid	
	4.3	Edible &Essential Oils	
	4.4	Soap & Detergent	
		Total	**30**

National Education Policy 2020

B.Sc. II Year (Semester - IV) Minor Course (Practical)

Course Code – SICCMP1251

Title of the Course: Practical based on SICCMT1251

[Credits: 2 (Marks: 50)] **(Total Periods: 60 Hours)**

CURRICULUM DETAILS: SICCMP1251: Practical based on SICCMT1251

Sr. No.	Practical Exercises	Hrs.
1.	Preperation of 1-4-dichloro 2 Nitrobenzene	4
2.	Preperation of Ethyl Benzoate	4
3.	Preperation of Methyl Benzoate	4
4.	Preperation of di Methyl Pthalate	4
5.	Estimation of Mohrs Salt	4
6.	Estimation of Manganese in Pyrulosite ore	4
7.	Esimation Of Phenols	4
8.	Estimation of Calcium in Milk	4
9.	Esimation of Casien in Milk	4
10.	Estimation of vitamin C	4
11.	Determination of Iodine Value of lubricating Oil	4
12.	Determination Of Aniline Point of Lubricating oil	4
13.	Saperation of Co & Ni on an anion exchanger method	4
14.	Saperation of Cd & Zn on an anion exchanger method	4
15.	Visit to the Chemical Industry	4
	Total	**60**

Text Books and Reference Books:

1. Practical Organic Chemistry by Dr. Vinay Prabha Sharma.
2. Advanced Practical Chemistry By R Mukhopadhyay & P.Chatarjee
3. Experiments and Calculations in Engineering Chemistry By Dr. S.S.Dara
4. Vogel -practical organic chemistry 5^{th} edition.

National Education Policy 2020

B.Sc. II Year (Semester - IV) Generic Elective Course

Course Code – SICCGE 1251

Title of the Course: Polluton Monitoring & Control

[No. of Credits: 2 Credit] [Total: 30 Hours]

CURRICULUM DETAILS: SICCGE 1251: Pollution Monitoring & Control

Module No.	Unit No.	Topic	Hrs.
1.0		**Air Pollution**	**08**
	1.1	Introduction, What is air Pollution	
	1.2	Composition of Air, Reactions in Troposphere	
	1.3	Reactions in Stratosphere, Reactions in Mesosphere and Ionosphere,	
	1.4	Sourses of Air Pollution, Units of measurements of air pollutants, Indoor air pollution, Mats , Coils and Aerosol sprays, Occupational Pollution.	
2.0		**Classification of Air Pollutants-** Biological contaminants	**07**
	2.1	Gaseous Pollutants- Inorganic &Organic gases	
	2.2	Particulate Pollutants &Aerosol Pollutants	
	2.3	Radioactive Pollutants &Carcinogens	
	2.4	Metallic Contaminants	
3.0		**Gaseous Pollutants-** Particulates- Types of Particulates, Effect of Particulate Pollutants on Plants & Humans, Control of Particulate Emmissions.	**07**
	3.1	Oxides of Nitrogen(NOx)-Reactions of NO2 in the atmosphere, Sourses of NOx Pollution, Effects of NOx on Plant & Man, NOx and Acid rain, Control of NOx Pollution.	
	3.2	Oxides of Sulphur (SOx)- Reaction of SO2 in the Atmosphere, Effect of SO2on Plant and material, SO2 and Acid rain, Control of SOx Pollution.	
	3.3	Oxides of Carbon (CO & CO2)-Sources of CO Pollution, reactions of CO in atmosphere, Effects of CO Pollutant, Control of CO Pollution .	

	3.4	Hydrocarbons-Natural Sources, Reactions of Hydrocarbons in the atmosphere, Effects of Hydrocarbons on Plants and Materials, Control of Hydrocarbons.	
4.0		**Analysis of Air Pollutants**	**08**
	4.1	Oxides of Nitrogen	
	4.2	Oxides of Sulpher	
	4.3	Oxides of Carbon	
	4.4	Particulate Matters	

Text Books and Reference Books:

1. Industrial Chemistry by V.K. Sharma
2. Pollution Monitoring and Control S.P. Mahajan

National Education Policy 2020

B.Sc. II Year (Semester - III) Vocational Skill Course

Course Code – SICVC1251

Title of the Course: Polymer Resin & Plastics

[No. of Credits: 2 Credit] **[Total: 60 Hours]**

CURRICULUM DETAILS: SICVC1101: Polymer Resin & Plastics

a) Theory: **20 Hrs**

Introduction of polymer, study of Plastics, Classification of Polymer, Mechanism ,

Practicals:

Sr. No	Practical Exercises	Hrs. Required
1.	Determination of acid Value of Plastic Material on	4
2.	Determination of Saponification Value of a Plastic Material	4
3.	Determination of Iodine Value of a Plastic Material	4
4.	Determination of carboxyl value of Plastic Material	4
5.	Determination of hydroxyl Value of Plastic material	4
6.	Preparation Of Phenol -Formaldehyde Resin	4
7.	Preparation of Urea -Formaldehyde resin	4
8	Synthesis and Hydrolysis of Nylon-66	4
9	Determination of Molecular Weight of a Polymer	4
10	Industrial Visit to Polymer Industry	4
	Total	**40**

Text Books and Reference Books:

1.Comphresive Industrial Chemistry by Dr.Prakash G.More

2. Practical Organic Chemistry by Dr. Vinay Prabha Sharma.

3. Advanced Practical Chemistry By R Mukhopadhyay & P.Chatarjee

4. Experiments and Calculations in Engineering Chemistry By Dr. S.S.Dara

5.Vogel -practical organic chemistry 5^{th} edition.