॥ 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

website: srtmun.ac.in

Fax : (02462) 215572

Phone: (02462)215542

Academic-1 (BOS) Section

E-mail: bos@srtmun.ac.in

विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरण–२०२० नुसार पदवी तृतीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२६–२७ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २२ एप्रिल २०२६ रोजी संपन्न झालेल्या मा.विद्यापरिषद बैठकीतील विषय क्र.०८/६४–२०२६ च्या ठरावानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील राष्ट्रीय शैक्षणिक धोरण–२०२० नुसार पदवी तृतीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२६–२७ पासून लागू करण्यास मा.विद्यापरिषदेने मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील बी.एस्सी. तृतीय वर्षाचे खालील विषयाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२६–२७ पासून लागू करण्यात येत आहे.

01	B.Sc. III Year Botany	10	B.Sc. III Year Biochemistry
02	B.Sc. III Year Chemistry	11	B.Sc. III Year Agriculture Microbiology
03	B.Sc. III Year Mathematics	12	B.Sc. III Year Electronics
04	B.Sc. III Year Zoology	13	B.Sc. III Year Seed Technology
05	B.Sc. III Year Microbiology	14	B.Sc. III Year Horticulture
06	B.Sc. III Year Geology	15	B.Sc. III Year Analytical Chemistry
07	B.Sc. III Year Enviornment & Earth Science	16	B.Sc. III Year Agrochemical & Fertilizers
08	B.Sc. III Year Statistics	17	B.Sc. III Year Industrial Chemistry
09	B.Sc. III Year Dairy Science	18	B.Sc. III Year Industrial 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/परिपत्रक/पदवी/बीएस्सी/२०२६–२७/60
दिनांक : १९.०६.२०२६

सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळे) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :–
१) मा. कुलगुरू महोदयांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. प्र.कुलगुरू महोदयांचे कार्यालय, प्रस्तुत विद्यापीठ
३) मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
४) मा. संचालक, परिक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
५) मा. प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY

NANDED–431606 (MS)

UNDER GRADUATE PROGRAMME OF SCIENCE & TECHNOLOGY

B.Sc.THIRD YEAR

SUBJECT—INDUSTRIAL CHEMISTRY

With Effect from theAcademicYear2026–2027

(Asper NEP-2020)

TABLEOFCONTENTS

From the Desk of the Dean,Faculty of Scienc eand Technology

Swami Ramanand Teerth Marathwada University, Nanded, enduring to its vision statement "Enlightened Student: A Source of Immense Power", is trying hard consistently to enrich the quality of science education in its jurisdiction by implementing several quality initiatives. Revision and updating curriculum to meet the standard of the courses at national and international level, implementing innovative methods of teaching-learning, improvisation in the examination and evaluation processes are some of the important measures that enabled the Universityto achieve the 3Es,the equity, the efficiencyand the excellence inhigher educationof this region. To overcome the difficultyofcomparing the performances ofthe graduating students and also to provide mobility to them to join other institutions the University has adopted the cumulative grade point average (CGPA) system in the year 2014-2015. Further, following the suggestions by the UGC and looking at the better employability, entrepreneurship possibilities and to enhance the latent skills of the stakeholders the University has adopted the Choice Based Credit System(CBCS) in the year 2018-2019 at graduate and post-graduate level. This provided flexibility to the students to choose courses of their own interests. To encourage the students to opt the world-class courses offered on the online platforms like, NPTEL, SWAYM, and other MOOCS platforms the University has implemented the credit transfer policy approved by its Academic Council and also has made a provision of reimbursing registration fees of the successful students completing such courses. SRTM University has been producing a good number ofhighcalibregraduates;however, it is necessaryto ensurethatour aspiringstudentsare able to pursuethe right education. Like the engineering students, the youngsterspursuing science education need to be equipped and trained as per the requirements of the R&D institutes and industries. This would become possible only when the students undergo studies with an updated and evolving curriculum to match globalscenario. Higher education is a dynamic process and in the present era the stakeholders need to be educated and trained in view of the self-employment and self-sustaining skills like startups. Revision of the curriculum alone is not the measure for bringing reforms in the higher education, but invite several other initiatives. Establishing industry-institute linkages and initiating internship, on job training for the graduates in reputed industries are some of the important steps that the University would like to take in the coming time. As a result, revision of the curriculum was the need of the hour and such an opportunitywas provided by the New Education Policy 2020. National Education Policy 2020 (NEP 2020) aims at equipping students with knowledge, skills, values, leadership qualities and initiates them for lifelong learning. As a result the students will acquire expertise in specialized areas ofinterest, kindle their intellectual curiosity and scientific temper, and create imaginative individuals. The curriculum given in this document has been developed following the guidelines of NEP-2020 and is crucial as well as challenging due to the reason that it is a transition from general science based to the discipline-specific-based curriculum. All the recommendations ofthe Sukanu Samiti given in the NEP Curriculum Framework-2023 have been followed, keeping the disciplinary approach with rigor and depth, appropriate to the comprehension level of learners. All the Board of Studies (BoS) under the Faculty of Science and Technology of this university have put in their tremendous efforts in making this curriculum of international standard.Theyhavetakencareofmaintaininglogicalsequencingofthesubjectmatterwith

proper placement of concepts with their linkages for better understanding of the students. Wetake this opportunity to congratulate the Chairman(s) and all the members of various Boards of Studies for their immensecontributions inpreparingtherevisedcurriculumfor thebenefitsofthe stakeholders in line with the guidelines of the Government of Maharashtra regarding NEP-2020. We also acknowledge the suggestions and contributions of the academic and industry experts of various disciplines. We are sure that the adoption ofthe revised curriculum will be advantageous for the students to enhance their skills and employability. Introduction of the mandatory On Job Training, Internship program for science background students is praise worthyand certainly help the students to imbibe firsthand work experience, team work management. These initiatives will also help the students to inculcate the workmanship spirit and explore the possibilities of setting up of their own enterprises.

Dr.M.K.Patil
Dean Faculty of Science andTechnology
Swami Ramanand Teerth Marathwada University,
Nanded

From the Desk of Chairman

Board of Studies in Chemistry & Industrial Chemistry

It gives me great pleasure to present the revised syllabus for **B.Sc. Third Year (Semester V & VI) – Chemistry**, prepared in accordance with the guidelines of the **National Education Policy (NEP) 2020** and the academic framework of **Swami Ramanand Teerth Marathwada University, Nanded**.

The present curriculum has been carefully designed to ensure a balanced integration of **fundamentalconcepts, practicalskills, andemergingtrendsinchemistry**. Emphasis has been placed on **application-oriented learning, interdisciplinary approach, skill development, and employability enhancement**, which are essential in the contemporary scientific and industrial landscape.

Special features of this syllabus include the introduction of courses such as **Applications of Software in Chemistry, Green Chemistry, Industrial Chemistry components, and Field Project/On-Job Training**, which aim to bridge the gap between theoretical knowledge and real-world applications. The inclusion of **Indian Knowledge System (IKS)** further enriches the curriculum by connecting traditional scientific wisdom with modern chemistry.

The syllabus also incorporates **modern pedagogical approaches, outcome-based education (OBE), and continuous assessment methods**, ensuring that students develop critical thinking, analytical ability, and research aptitude.

I sincerely appreciate the valuable contributions of all **Board of Studies members, subject experts, and faculty colleagues** who have actively participated in designing and refining this curriculum.

I am confident that this revised syllabus will significantly contribute to the**holistic academic and professional development of students**, preparing them to meet the challenges of higher education, research, and industry.

Dr.D.R.Munde
Chairman
Board of StudiesinChemistry
Swami Ramanand Teerth Marathwada University,Nanded

Details of the Board of Studies Members in thesubject Industrial Chemistry under the faculty of Science & Technology of S.R.T.M. University, Nanded

Sr.No.	Name	Address	Designation
1.	Dr.D.R. Munde	ScienceCollege,Nanded	Chairman
2.	Dr.A.M. Chougule	Dayanand Science College Latur	Member
3.	Mr.R.K.Jadhav	Dayanand Science College Latur	Member
4.	Mr.S.V.Navhate	Sanjeevani Mahavidyalaya Chapoli	Member

ABBREVIATIONSUSED

Abbreviation	FullForm
POs	ProgramOutcomes
PS	ProgramStructure
PSOs	ProgramSpecificOutcomes
COs	CourseOutcomes
TLP	Teaching-LearningProcess
AM	AssessmentMethod
DSC	DisciplineSpecificCore
DSE	DisciplineSpecificElective
GE	GenericElective
OE	OpenElective
VSC	VocationalSkillCourse
SEC	SkillEnhancementCourse
IKS	IndianKnowledgeSystem
AEC	AbilityEnhancementCourse
VEC	ValueEducationCourse
OJT	OnJobTraining(Internship)
FP	FieldProject
CC	Co-curricularCourses
RM	ResearchMethodology
RP	ResearchProject
MJ	Major Course
MN	MinorCourse

INTRODUCTION TO UNDERGRADUATE DEGREE IN INDUSTRIAL CHEMISTRY

As perthe guidelines ofthe **University Grants Commission (UGC)** and the framework adopted by **Swami Ramanand Teerth Marathwada University, Nanded**, the **Undergraduate (UG) Programme in Chemistry** is structured under the **National Education Policy (NEP)** with a flexible **Four-Year(Eight Semesters)** framework, withanoptionto exit after **Three Years(Six Semesters)**.

The **Teaching–Learning Process (TLP)** is designed to be **student-centric, outcome-based,and skill-oriented**, integrating theory, practical, vocational, and experiential learning components. The curriculum ensures a **strong foundation in core Chemistry subjects** along with opportunities for advanced learning and interdisciplinary exposure.

Theprogrammeincludesacombinationofthefollowingcoursetypes:

- **Major(DSC/MJ–Discipline SpecificCore/MajorCourses)**
- **Minor(MN/DSE – DisciplineSpecific Electives)**
- **VocationalSkillCourses(VSC)**
- **SkillEnhancementCourses(SEC)**
- **IndianKnowledgeSystem(IKS)**
- **Open/GenericElectives(OE/GE)**
- **AbilityandValueEnhancementCourses(AEC/VEC)**
- **FieldProjects,Internships(OJT),andCommunityEngagementProjects(CEP)**

This structure promotes a multidisciplinary and interdisciplinary approach, allowing students to explore diverse academic areas alongside their core discipline. The programme offers flexibility in course selection, credit accumulation, and academic progression, enabling students to design their learning pathway based on their interests, aptitude, and career aspirations.

Furthermore, the provision of multiple entry and exit options ensures that students can obtain Certificate, Diploma, Degree, or Honours Degree at different stages, thereby enhancing employability and supporting higher education opportunities.

Overall, the UG Programme in Chemistry under SRTMU aims to develop scientific knowledge, practical skills, critical thinking, research aptitude, and professional competence, preparing students for higher studies, research, and diverse career opportunities in industry, academia, and allied fields.

PROGRAM DURATION AND EXIT OPTIONS

The duration of the **Undergraduate (UG) Programme in Industrial Chemistry** at **Swami Ramanand Teerth Marathwada University, Nanded** shall be **four years (Eight Semesters)** under the NEP framework. Students shall have **multiple entry and exit options** as per NEP guidelines:

- Students completing only three years (SixSemesters) will be awardeda Bachelor of Science(B.Sc.) Degree in Industrial Chemistry.
- Students exitingafter thefirst year (TwoSemesters) will be awarded an Undergraduate Certificate in Industrial Chemistry, provided they have earned the prescribed credits.
- Students exitingafter thesecondyear (FourSemesters)will be awarded anUndergraduateDiploma in Industrial Chemistry, subject to fulfilment of required credits.
- Students completing thefour-year programme (EightSemesters) will be awardeda Bachelor of Science in Industrial Chemistry (Honours / Honours with Research) as per university regulations.

Students who exit theprogramme at any stage(Certificate/Diploma) shall be eligible for re-entry within a maximum period of three years, subject to university rules and availability of seats.

Thecreditframeworkisdesignedtoensureflexibilityinacademicprogression:

- Minimumcreditspersemester:18
- Maximumcreditsper semester:26
- Recommendedcreditspersemester:22

Table1:AwardsandRequiredCredits

Sr. No.	NCrF/NHEQF Level	TypeofAward	StageofExit/Programme Duration	Credits Required
1	Level4.5	Undergraduate Certificate in Industrial Chemistry	After success fulcompletion of First Year (Semester I & II)	**44**
2	Level5.0	Undergraduate Diploma in Industrial Chemistry	After success fulcompletion of Second Year (Semester III &IV)	**88**
3	Level5.5	BachelorofScience (B.Sc.) in Industrial Chemistry	After successs fulcompletion of ThirdYear(Semester V&VI)	**132**
4	Level6.0	BachelorofScience in Industrial Chemistry (Honours/Honours with Research)	Aftersuccessfulcompletionof Fourth Year (Semester VII &VIII)	**176**

OBJECTIVES OF THE PROGRAM

- To strengthen students' understanding of fundamental and advanced concepts in Industrial Chemistry .
- To develop the ability to apply chemicall principles to solve theoretical and practical problems in Industrial chemistry.
- To enhance laboratory skills and experimental techniques required for qualitative and quantitative analysis.
- To promote critical thinking, analytical ability,and scientific reasoning among students.
- To familiarize students with the applications of Industrial chemistry in industry, environment, health, and daily life.
- To develop awareness about green chemistry,safety practices,and environmental sustainability.
- To encourage research orientation,innovation,and higher learning in the chemical sciences.

PROGRAM OUTCOMES

After successful completion of the B.Sc. Industrial Chemistry programme, students will be able to:

PO1: Disciplinary Knowledge

Demonstrate comprehensive knowledge of fundamental and advanced concepts **inUnit Process, Unit Operation , Drug Dyes, Industrial Polymer Industrial Physical, Industrial Organic, and Industrial Inorganic Chemistry**, including theoretical and practical aspects.

PO2**: ProblemAnalysis**

Use chemical concepts, mathematical techniques, and scientific reasoning to identify, formulate, and resolve complex theoretical and experimental problems.

PO3**: CriticalThinking**

Enhance critical thinking and analytical abilities to assess scientific data, interpret findings, and arrive at logical conclusions.

PO4:**Experimental Skills & LaboratoryCompetence**

Conduct qualitative and quantitative chemical analyses using standard laboratory techniques, instruments, and modern tools with a high degree of accuracy and precision

PO5: **Modern ToolUsage**

Utilize on temporary chemical software, instrumentation,and ICT tools for data analysis, simulation, and research applications.

PO6:Environment and Sustainability

Comprehend the significance of Industrial Chemistry in environmental protection and sustainable development, including the principles of green chemistry and pollution control.

PO7:Ethics and Safety

Adhere to ethical standards, laboratory safety procedures, and professional responsibilities in both academic and industrial environments.

PO8:CommunicationSkills

Convey scientific information clearly and effectively through oral presentations, laboratory reports, and technical writing.

PO9:LifelongLearning

Acknowledge the importance of ongoing learning and professional development in the field of chemical sciences and related disciplines.

PO10:Research and Innovation

Build research aptitude along with creativity and innovative skills to pursue higher education, research, and entrepreneurial ventures.

PO11:Teamworkand Leadership

Function effectively both independently and as a member or leader within multidisciplinary teams.

PO12: Application in Society and Industry

Utilize chemical knowledge to address real-life problems in industry, health, agriculture, and the environment.

PROGRAM SPECIFIC OUTCOMES

After completion of the programme,students will be able to:

PSO1:Core Industrial ChemistryCompetence

Acquirein-depth knowledge of core are as such as:

- Unit Operations & Unit Processes, Thermodynamics, kinetics,and quantum chemistry
- Organic reaction mechanisms and synthesis
- Coordination chemistry,spectroscopy,and materials chemistry

PSO2: Laboratory Proficiency

Develop hands-on skills in:

- Industrial Manufacturing Processes, Volumetric,gravimetric,and instrumental analysis
- Organic synthesis and purification techniques
- Handling modern instruments like pH meter,conductometer,spectrophotometer,etc.

PSO3: Application of Chemical Knowledge

Apply chemical concepts in:

- Industrial processes (fertilizers,polymers, pharmaceuticals)
- Environmental monitoring and pollutioncontrol
- Health,foodchemistry,and daily life applications

PSO4: Green Chemistry and Sustainability

Implement principles of green chemistry,waste minimization,and eco-friendly practices in laboratory and industrial contexts.

PSO5:ResearchOrientation

Design and conduct basic research experiments,analyze data,and present findings scientifically.

PSO6: Interdisciplinary Understanding

Integrate chemistry with related fields such as**biology,physics, environmental science,and material science**.

PSO7: Employ ability and Skill Development

Develop skills relevant to:

- Chemical industries, Fertilizers, Cement,Pharmaceutical, Sugar etc.
- Quality control laboratories
- Teaching and research
- Competitive examinations and higher education

GENERAL GUIDELINES FOR THE SELECTION OF SUBJECTS

1. A student has to choose three subjects from the same faculty in the first year. At the start of the second year,he/she has toopt for one subject as the Major subject and one(from the remaining two subjects) as the Minor subject; the last one will be dropped by the student.
2. A student cannot select a subject asMajor or Minor other than the subjects take in the firstyear.
3. OE(Open Elective)is to be chosen compulsorily from a faculty other than that of theMajor.
4. SECis tobeselectedfromthebasketofSkillCourses approvedbytheuniversity.
5. VSC,FP/OJT/CEP should be related to theMajor subject.
6. AEC,VEC, IKS(Generic), andCC will be provided by the university separately.

TEACHING-LEARNINGPROCESS

a. Courses will be taught through the traditionalchalk-and-talk method, laboratory work, ICT-enabled teaching–learning tools, project work, seminars, case studies, field work, internships, hands-on training, etc.

b. Students will been angaged in various student-centric activities including experiential learning, problem-solving methodologies, participative learning, and ICT-based teaching–learning processes.

c. ICT tools in Basic andAdvanced Chemistry software will be used to make the teaching–learning process efficient and engaging.

d. Critical, analytical, and problem-solving abilities will be developed through project-based learning, internships, industrial visits, and hands-on training.

e. Problem-solving methodologies such as quizzes ,review of books and research papers,workshops, and research-based competitions will be employed.

f. Vocational and skill training will be conducted through vocational and skill-based courses.

g. Students will be introduced to advanced laboratory instruments for hands-ontraining.

METHODS OF ASSESSMENT

The primary objective of assessment is to evaluate the attainment of learning outcomes of the course in alignment with the broader goals of strengthening core theoretical knowledge, developing practical laboratory skills, and promoting research aptitude among students.

The assessment system shall be based on **Continuous Internal Evaluation (CIE)** and **End Semester University Examination (ESE)** as per the norms of **Swami Ramanand Teerth Marathwada University, Nanded**.

Continuous Internal Evaluation(CIE)

During the semester, students'performance and masteryofthe prescribed learning outcomes will be evaluated through various academic activities such as:

- Short answer tests
- Class tests
- Seminars and presentations
- Group discussions
- Quizzes and MCQs
- Assignments and tutorials
- Project work

Each theoryand practical course shall carry **10 marks for internal assessment (for each-credit course)**. The internal assessment will be conducted by the respective colleges as per university guidelines.

End SemesterExamination(ESE)

The End Semester Examination will be conducted by **Swami Ramanand Teerth Marathwada University, Nanded** for both theory and practical courses. Each credit course shall carry **15 marks for the End Semester Examination (ESE)**.

SchemeofExamination

- Total marksfor 2-creditcourse: 50(20Internal+30 ESE)
- Total marksfor 4-creditcourse: 100(40Internal+60 ESE)
- Internal examinations willbeconductedbytherespectivecolleges.
- External examinations will be conducted bySRTMU, Nanded at the end of each semester.

Marks distribution under CA (40%)

Sr. No.	ContinuousAssessment Modes	For4Credit (Marks)	For2Credit (Marks)	For 3 Credit (Marks)
1	ClassTest	20	10	15
2	Assignment, Presentation, Viva, Quiz, OpenBook,etc.	12	06	09
3	Attendance	08	04	06
	Total	**40**	**20**	**30**

STRUCTUREOF B.Sc.ThirdYear—SemesterV(Level5.5)

TeachingScheme

Subject	CourseCode	CourseName	CreditsAssigned			Teaching (Hrs/wk)	
			Theory	Practical	Total	Theory	Practical
Major	SICCT1301	Unit Processes of Organic synthesis	03	–	03	03	--
	SICCP1301	Practical based on SICCT1301	--	02	02	--	04
	SICCT1302	Process Equipement Design & Process Instrumentation.	03	--	03	03	--
	SICCP1302	Practical based on SICCT1302	--	02	02	--	04
	SICIKS1301	Subject Specific–IKS in Industrial Chemistry	02	--	02	02	--
Elective	SICET1301 OR SICET1302	Industrial Organic & Inorganic Chemistry OR Application-Based Analytical Chemistry (Theory)	02	–	02	02	--
	SICEP1301 OR SICEP1302	PracticalCourse Industrial Organic & Inorganic Chemistry OR Application-Based Industrial Analytical Chemistry(Practical)	–	02	02	–	04
Vocational Course	SICVC1301	Drug & Drug Intermediates	–	02	02	–	04
Field Project	SICFP1301	Field Project in Industrial Chemistry SICFP-1301	–	04	04	–	08
TotalCredits			10	12	**22**	**10**	**24**

B.Sc.ThirdYear—SemesterV

ExaminationScheme

Subject(1)	CourseCode (2)	CourseName(3)	Theory/Practical					Total Col(7) /Col(8) (09)
			ContinuousAssessment(CA)			(4+5+6) =7	ESA (8)	
			Test(4)	Assignment (5)	Attendance (6)			
Major	SICCT1301	Unit Processes of Organic synthesis	15	09	06	30	45	75
	SICCP1301	Practical based on SICCT1301	10	06	04	20	30	50
	SICCT1302	Process Equipement Design & Process Instrumentation.	15	09	06	30	45	75
	SICCP1302	Practical based on SICCT1302	10	06	04	20	30	50
	SICIKS1301	Subject Specific–IKS in Industrial Chemistry	10	06	04	20	30	50
Elective	SICET1301 OR SICET1302	Industrial Organic & Inorganic Chemistry OR Application-Based Industrial Analytical Chemistry (Theory)	10	06	04	20	30	50
	SICEP1301 OR SICEP1302	Practical Course Industrial Organic & Inorganic Chemistry OR Application-Based Industrial Analytical Chemistry(Practical)	10	06	04	20	30	50
Vocational Course	SICVC1301	Drug & Drug Intermediates	10	06	04	20	30	50

Field Project	SICFP1301	Field Project in Industrial Chemistry SICFP-1301	20	12	08	40	60	100

B.Sc.ThirdYear—SemesterVI(Level5.5)

TeachingScheme

Subject	CourseCode	CourseName	CreditsAssigned			Teaching (Hrs/wk)	
			Theory	Practical	Total	Theory	Practical
Major	SICCT1351	Unit Processes of Inorganic Synthesis	03	–	03	03	--
	SICCT1352	Industrial Inorganic Chemistry	03	--	03	03	--
	SICCT1353	Industrial Spectroscopy	02	--	02	02	--
	SICCP1351	PracticalbasedonSICCT1351+ SICCT1353	--	02	02	–	04
	SICCP1352	PracticalbasedonSICCT1352+ SICCT1353	--	02	02	–	04
Elective	SICET1351 OR SICET1352	Industrial Physical Chemistry OR Introduction to Polymers	02	–		02	–
	SICEP1351 OR SICEP1352	PracticalCourse in Industrial Inorganic Chemistry OR Practical Course in Introduction to Polymers Chemistry	–	02	02	–	04
Vocational Course	SICVC1351	Dyes & Dyes Intermediates.	–	02	02	–	04
OJT	SICOJT1351	On-JobTraining(OJT) in Industrial Chemistry	–	04	04	–	08
TotalCredits			10	12	22	10	24

B.Sc.ThirdYear—SemesterVI

ExaminationScheme

Subject(1)	CourseCode (2)	CourseName(3)	Theory/Practical					Total Col(7) /Col(8) =(09)
			ContinuousAssessment(CA)			(4+5+6) =7	ESA (8)	
			Test (4)	Assignment (5)	Attendance (6)			
Major	SICCT1351	Unit Processes of Inorganic Synthesis	15	09	06	30	45	75
	SICCT1352	Industrial Inorganic Chemistry	15	09	06	30	45	75
	SICCT1353	Industrial Spectroscopy	10	06	04	20	30	50
	SICCP1351	Practical based on SICCT1351+ SICCT1353	10	06	04	20	30	50
	SICCP1352	Practical based on SICCT1352+ SICCT1353	10	06	04	20	30	50
Elective	SICET1351 OR SICET1352	Industrial Physical Chemistry OR Introduction to Polymers	10	06	04	20	30	50
	SICEP1351 OR SICEP1352	PracticalCourse in Industrial Inorganic Chemistry OR Practical Course in Introduction to Polymers Chemistry	10	06	04	20	30	50
Vocational Course	SICVC1351	Dyes & Dyes Intermediates.	10	06	04	20	30	50
OJT	SICOJT1351	On-JobTraining(OJT) in Industrial Chemistry	20	12	08	40	60	100

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science & Technology

Name of theProgram	B.Sc.(Industrial Chemistry)
Title of thePaper/Course	Unit Processes of Organic Synthesis(Theory) [SICCT-1301]
Year of Implementation	AcademicYear 2026–2027
Semester	V
PaperType	DSC(Major Core)
Credits	03
TotalHours	45 Hours
FormativeAssessmentMarks	30
SummativeAssessment Marks	45
TotalMarks	75

Course Objectives (CO):

1. To develop a comprehensive understanding of **Unit Process** .
2. To impart knowledge of **Nitrations** their classification,synthesis,and applications in medicinal and industrial chemistry.
3. To explain various types of **Amination by Reduction** and their mechanistic pathways.
4. To introduce fundamental concepts of **Halogenation**, including properties and applications.
5. To enhance Knowledge and problem-solving abilities Sulphonation & Sulphation.

CourseOutcomes(COs):

CO No.	Uponcompletionofthiscourse,studentswillbeable to:	Bloom'sLevel	PO Mapped
CO1	Explain Unit Processes	Understand / Apply	PO1,PO2
CO2	Analyze Behamp Rduction , N-Nitro Compound, Nitrate Esters	Analyze	PO2,
CO3	Describe synthesis,classification,and applications of Amination By Reduction using Various Reducing agents	Understand / Apply	PO1,PO3
CO4	Explain mechanisms of **molecular rearrangements** (electrophilic,nucleophilic,freeradical).	Analyze	PO1,
CO5	Explain Varios types of Halogenation	Understand / Apply	PO1,PO4
CO6	Explain Sulphonating & Sulphating agents..	Understand	PO1,PO5

Detailed Syllabus

Module No.	Unit No.	Topic	Hrs. Requiredto coverthe contents
1.0		**Nitration :**	**12**
	1.1	Introduction, Niitrating Agents.	
	1.2	Aromatic Nitration, Kinetics & Mechanism ofAromatic Nitration,	
	1.3	Nitration of Paraffin hydrocarbons, Nitrate Esters, N-NitroCompounds Equipment for Technical Nitration, Batch Nitration,Continuous Nitration	
	1.4	Mixed acid compositions, DVS calculations, Preparation of Nitrobenzene, Preparation of dinitrobenzene	
2.0		**Amination by Reduction :**	**11**
	2.1	Introduction & Definations	
	2.2	Methods of Reduction, Iron & Acid (Bechamp)Reduction-Reaction Mechanism, Chemical & Physical factors, Physical condition of Iron, Amount of water used, Amount of Acid used,	
	2.3	Amount of Acid used, Effect of Agitation,Reaction Temperature, Addition of Solvents, Yields of amine. E	
	2.4	. Equipment-Materials of Aniline & Recovery of Aniline, Distillation of Aniline.	
3.0		**Halogenation :**	**12**
	3.1	Introduction, Fluorination.	
	3.2	Chlorination	
	3.3	Bromination,	
	3.4	Iodination	
4.0		**Sulfonation & Sulfation :**	**10**
	4.1	Introduction,	
	4.2	Sulfonating & Sulfating agents	
	4.3	Sulfonation of Aromaticcompounds	
	4.4	Naphalene & its derivatives,Anthraquinone & its derivatives. , Benzene & its derivatives .	
		Total	**45**

Recommended Textbooks

1. Unit Processes in Organic synthesis – P.H.Groggins, 5 th edn, Tata Mcgraw-Hill Publishig company limited , New Delhi, 1995
2. Industrial Chemistry – B.K.Sharma, Goel Publishing House , Meerut, 15 th edn, 2006. Chemical Processes- Shreve's .
3. Study Material – UGC sponsored vocational course in Industrial Chemistry-1997.
4. Industrial Chemistry (Experimental Study Book-NEP 2020)-Dr.P.S.Mane, MEWADEV GRANTH AVADEMY, 202

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science andTechnology

Name of theProgram	B.Sc.(Industrial Chemistry)
Title of thePaper/Course	(Practical) [SCHECP1301]
Year of Implementation	AcademicYear 2026–2027
Semester	V
PaperType	DSC (Practical)
Credits	02
Total Hours	60 Hours
Formative Assessment Marks	20
SummativeAssessment Marks	30
Total Marks	50

Course Objectives

1. The students are expected to learn experimentally –
2. General Principles of organic aromatic reactions, types of organic synthesis & their industrial importance and amination by reductions.
3. Halogenation , Sulphonation and sulfation reactions.
4. Oxidations & Hydrogenatins Course Outcomes :

CourseOutcomes(COs)

Aftercompletingthiscourse, studentswillbeableto:

CO No.	Upon completion of this course,students will be ableto:	Bloom's Level	PO Mapped
CO1	The students understood about types organic aromatic reactions, types of organic synthesis & their industrial importance and amination by reductions	Apply	PO3,PO4
CO2	The students understood about Types of Halogenation , Sulphonation and sulfation reactions.	Understand /Analyze	PO1,PO2
CO3	The students are knowing Oxidations & Hydrogenatins...	Apply / Analyze	PO3,PO4

Sr. No	PracticalExercises	Hrs.Required to cover the contents
1.	Preparation of tri-nitrophenol (picric acid) from Phenol & Calculate % Yield.	4
2.	Preparation of oxalic acid from cane sugar & Calculate % Yield.	4
3.	Preparation of benzophenoloxine from benzophonone & Calculate % Yield.	4
4.	Prepartion of P-Bromoaniline from P-bromoacetanalide & Calculate % Yield.	4
5.	Preparation of Phenyl acetate from phenol & Calculate % Yield.	4
6.	Preparation of Polystyrene by Bulk/Suspension/Emulsion Polymerization method & Calculate % Yield.	4
7.	Preparation of 6,6 and 6,10 thread by condensation & Calculate % Yield.	4
8.	Preparation of Novalac & Resole – Thermosetting resin & Calculate % Yield.	4
9.	Preparation of Urea formaldehyde resin & Calculate % Yield.	4
10.	.Preparation of Polysulphide rubber (Thiokol) & Calculate % Yield.	4
11.	Prepration of Orange II dye	4
12.	Estimation of Glucose.	4
13.	Estimation of Maganese in Pyrolusite ore	4
14.	Estimation of Zink from Zink Blend ore	4
15.	Estimation of Antimony in type metal	4
	Total	**60**

Referance Books;

1. Practical Mannual for UGC sponsored vocational subject in Industrial Chemistry-Polymers, 1997.

2. A Text book on Experiments and Calculations in Engineering Chemistry –SSDara, S.Chand & Co.ltd.Publication 2007.

3.Industrial Chemistry (Experimental Study Book-NEP 2020)-Dr.P.S.Mane, MEWADEV GRANTH AVADEMY, 2025

4.Advanced Practical Chemistry R. Mukhopaddhyay ,P.Chatargee.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science &Technology

Name of theProgram	B.Sc.(Industrial Chemistry)
Title of thePaper/Course	Process Equipement Design & Process Instrumentation(Theory) [SICCT-1302]
Year of Implementation	AcademicYear 2026–2027
Semester	V
PaperType	DSC(Major Core)
Credits	03
Total Hours	45 Hours
Formative Assessment Marks	30
SummativeAssessment Marks	45
Total Marks	75

Course Objectives

1. The students are expected to learn design & construction the equipments used in industrial processes –
2. Distillation & fractionating equipments, Evaporation & Crystallization
3. Centrifugation & Agitators,& Reaction Vessel.
4. Study of Temperature Measurement in Industry.
5. To Study Preasure Measurement in Industry.

CourseOutcomes(COs)

CO No.	RefinedCourseOutcomes	Bloom's Level	PO Mapping
CO1	The students understood about the basics & design for equipments used for distillaltion, evaporation & Crystallization.	Understand/ Apply	PO1,PO2
CO2	The students known about Centrifugation & agitators used in manufacturing process. Understood the reaction.	Analyze	PO2,PO4
CO3	To student Know about Temperature Measurement like Bimetalic Thermometer, Resistance Temperature Detector	Apply	PO3,PO4
CO4	To Students understand about Bourdon & Helical pressure Sensors- bourdon Pressure Sensors Spiral Bourdon Pressure SensorsHelical bourdon Pressure Sensors	Apply / Analyze	PO2,PO5

Detailed Syllabus : Process Equipement Design & Process Instrumentation(Theory) [SICCT-1302]

Module No.	Unit No.	Topic	Hrs. Requiredto cover the contents
1.0		**Distillation.**	**12**
	1.1	Introduction,Types of Distillation	
	1.2	Types Column, Stresses in column Shell	
	1.3	Determination of Shell thickness, Determination height "X", Allowable deflection.	
	1.4	Column Internal details,Equilibrium stage column, Differential Column	
2.0		**Agitators & Reaction Vessel** .	**11**
	2.1	Introduction, Types of Agitators	
	2.2	Classification of Recation Vessel.	
	2.3	Heating System	
	2.4	Design Consideration	
3.0		**Temperature Measurements**	**10**
	3.1	Introduction .	
	3.2	Filled-Bulb & Glass-Stem Thermometers Glass-Stem Thermometers	
	3.3	Bimetallic Thermometers , Resistance Temperature Detector (RTD's)	
	3.4	Radiation & Pyrometers.	
4.0		**Pressure Measurements**	**12**
	4.1	Introduction Manometers-U tube, Well, Inclined & Micromanoters.	
	4.2	Bourdon & Helical pressure Sensors- bourdon Pressure Sensors Spiral Bourdon Pressure SensorsHelical bourdon Pressure Sensors	
	4.3	Diaphragm or Capsule type sensors	
	4.4	Pressure Gauges.	
		Total	**45**

Recommendedbooks

1) Process Equipment Design- M.V.Joshi,

2) Process Equipment DesignMahajani & JoshiM.V.Joshi ,

3) Perry's Handbook of Engineering Chemsitry.

4) Study Material for UGC sponsored Industrial Chemistry-Material Science-Corrosion.,

1997. Industrial Chemistry-BK Sharma, Goel publishing house, Meerut Industrial Chemistry (Experimental Study Book-NEP 2020)-Dr.P.S.Mane, MEWADEV GRANTH AVADEMY, 2025

E-Resources/ MOOCs

1. NPTEL Courseson Physical Chemistryand Molecular Spectroscopy
2. SWAYAM undergraduate Industrial chemistry resources
3. e-PGPathshala resources in Industrial Chemistry

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science &Technology

Name of theProgram	B.Sc.(Industrial Chemistry)
Title of thePaper/Course	Practical based onSICCT1302[SICCP1302]
Year of Implementation	AcademicYear 2026–2027
Semester	V
PaperType	DSC (Practical)
Credits	02
Total Hours	60 Hours
Formative Assessment Marks	20
SummativeAssessment Marks	30
Total Marks	50

Course Objectives

1. To develop experimental proficiency in Industrial techniques,including both instrumental and non-instrumental methods.
2. To familiarize students with modern analytical instruments such as Manometers, Coil Tube Reactor, Centrifugal Pump and their practical applications.
3. To enhance analytical and problem solving abilities through interpretation of experimental data and calculation of physicochemical parameters.
4. To strengthen understanding of chemical kinetics, thermodynamics and solution behavior through laboratory experimentation.
5. To promote safe laboratory practices, accuracy, teamwork, and systematic scientific record keeping**.**

Course Outcomes (COs)

After completionofthiscourse,studentswillbeableto:

CO No.	Upon completion of this course,students will be able to:	Bloom's Level	PO Mapped
CO1	Perform such as Manometers, Coil Tube Reactor, Centrifugal Pump and their practical applications.Experiments using appropriate instruments with accuracy and precision.	Apply	PO1
CO2	Analyze experimental data to determine physicochemical Distribution Constant.	Analyze	PO4,PO5
CO3	Apply principles of chemical kinetics,thermodynamics,and Solution chemistry to interpret experimental observations.	Apply / Analyze	PO2,PO4
CO4	To Study Heat of solution partial molar Volume.	Apply	PO3,PO5
CO5	Record, organize, and present experimental results Systematically with proper calculations,graphs,and conclusions.	Analyze	PO4,PO6

List of Experiments Practical based onSICCT1302 [SICCP1302]

Sr. No	PracticalExercises	Hrs. Requiredto cover the contents
1	Heat of Neutralization of Strong Acid & Strong Base.	4
2	Determine the Heat of Neutralization Hcl by NaOH.	4
3	Determine Heat of Ionization of Acetic Acid .	
4	Determine Heat of Precipitation of $BaSO_4$.	4
5	Determine solubility of KnO_3 (Nitre) In Water At Different Temperature 30^0,40^0,50^0.60^0,70^0 & to Plot solubility Curve.	4
6	Study the U-Tube Manometer.	4
7	Study The Distribution of Benzoin acid Between Benzene & Water At Room Temperature & hence Show molecular state of Benzoic acid in Benzene.	4
8	Determine the solubility of Benzoic acid in water at different Temperature& hence its Heat of Solution.	4
9	Study the effect of addition of an electrolyte on the solubility of monobasic organic acid at the room temperature.	4
10	Determine partial molar volume of ethanol water mixture at given composition.	4
11	Determine the % composition of a given Mixture two Liquids by Stalagmometer Meter.	4
12	Study the Effect of surfactant (n-Prpyl Alcohole)at Various concentration hence determine the limiting cross sectional area of molecule by stalagmometer.	4
13	Study the Coil Tube Reactor	4
14	Study the Centrifugal Pump.	4
15	Industrial visit & Report.	4
	Total	**60**

ReferenceBooks(LaboratoryWork)

1. S. W. Rajbhojand T. K. Chondekar, *Systematic Experimental Physical Chemistry*, Anjali

Publication, Aurangabad.
2. J.B. Yadav,*Advanced Practical PhysicalChemistry*, GoelPublication, Meerut.
3. O.P. Pandey,D.N.BajpaiandS. Giri,*Practical Chemistry*, S.Chand Publications.
4. D.V.Jahagirdar,*Experiments in Chemistry*,HimalayaPublishing House.
5. Gurtuand Gurtu,*AdvancedPhysical ChemistryExperiments*,PragatiPublication.
6. B. D. Khosla, V. C. Garg and A. Galati, *Senior Practical Physical Chemistry*, R. Chand& Company.
7. R. C. DasandB. Behra,*ExperimentsinPhysicalChemistry*, TataMcGraw Hill.
C. W. Garland, J. W. Nibler and D. O. Shoemaker, *Experiments in Physical Chemistry* ,McGraw Hill (2003).
8. A.FindlayandT.A.Kitchener,*Practical PhysicalChemistry*,Longmans.
9. VishwanathanandRaghwan,*Practical PhysicalChemistry*,VivaBooks.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science &Technology

Subject Specific - IKS

Name of theProgram	B.Sc.ThirdYear(Industrial Chemistry)(Theory)
Title of thePaper/Course	IndianKnowledgeSystemin Chemistry(SICIKS1301)
Year of Implementation	AcademicYear2026–27
Semester	V
PaperType	IKS(IndianKnowledgeSystem)
Credits	(Theory:2)
Total Hours	30Hours (Theory)
Formative Assessment Marks	20 Marks(InternalAssessment)
SummativeAssessment Marks	30Marks(Semester EndExamination)
Total Marks	50Marks

Course Objectives(CO)

1. To introducestudents totherich chemical heritageof Indiafrom prehistorictoancient periods.
2. To develop an understanding of Indian philosophical concepts of matter and atomic theories.
3. To explore the applications of chemistry in ancient Indian medicine, textiles, metallurgy, and daily life.
4. To examine traditional chemical techniques such as distillation,calcination,and fermentation from a modern scientific perspective.

CourseOutcomes(COs)

CO No.	Course Outcoms Statement	Bloom's Level	PO Mapping
CO1	Explain early chemical traditions and material Advancements from prehistoric to Harappan India.	Understand	PO1,PO3, PO9
CO2	Analyze Vedic and philosophical concepts of matter, Including Vaisheshikaand Jainato mictheories.	Analyze	PO2,PO3, PO10
CO3	Evaluate applications of chemical knowledge einancient Indian medicine,textiles,and house hold materials.	Evaluate	PO6,PO8, PO12
CO4	Apply knowledge of ancient chemical techniques such as metallurgy, distillation ,sublimationn,and fermentation.	Apply	PO4,PO5, PO7,PO11

DetailedSyllabus(FourModules– 30Hours)

Module No.	UnitTitle	Topics	Hours
I	Early Chemical Traditions Prehistoric to Harappan India	• Pre-Harappan developments: early settlements, pottery techniques, coloured ceramics, copper extraction and fabrication. • Harappanadvancements:ceramictechnology,faience,pigments (ferric oxide, manganese oxide), glazed pottery, construction materials (gypsum, lime, sand). • Metals and minerals: copper, bronze alloys, gold, silver, semi-precious stones, galena, natural dyes (madder). • Post-Harappan phase: cultural transition and spread of metallurgical practices.	07
II	Vedic Knowledge and Philosophical Concepts ofMatter	• Chemical knowledge in Vedic texts: metals, alloys, Fermentation (soma,sura),naturaldyes,medicinalplantuse. • Atomic theories: Vaisheshika (Kanada) – paramanu, atomic combinations, molecular structures; Jain theory – atomic forces and chemical affinity. • SamkhyaandNyayaperspectives:evolutionofmatter, tanmatras,sensoryproperties,conceptofakasha.	07
III	Applications of Chemistry in Ancient India	• Medicine(Ayurveda):Rasashastra,herbalandmineral-based preparations. • Textiles:naturaldyes(indigo,madder,turmeric),mordants, dyeing techniques. • Toolsandweapons:metalcraftingandhardeningtechniques. • Ceramicsandhouseholdmaterials:glazedpottery,terracotta, soaps, oils, and cosmetics. • Constructionmaterials:gypsum,lime,andsand-basedbinders and plasters.	08
IV	Ancient Chemical Techniques and Processes	• Metallurgy (धातुकर्म): extraction, purification, and alloy formation (brass, bronze, wootz steel). • Distillation(आसवनप्रक्रिया):preparationofperfumes,essential oils, and medicines. • Othertechniques:sublimation(उर्ध्वपातन),calcination,and fermentation processes in beverages and medicinal formulations.	08

Total:30 Hours

RecommendedTextbooks

1. Pakrashi, B. C., & Ghosh, S. (Eds.). *History of Science in India, Vol. III: Chemical Sciences*. The National Academy of Sciences, India (NASI) & Ramakrishna Mission Institute of Culture, Kolkata.
2. S. Mahdihassan, *Indian Alchemy: Its Origin and Ramifications*, Motilal Banarsidass, 1991.
3. B.V.Subbarayappa,*Chemistryin Ancient andMedieval India*,INSA,1999.
4. P.C.Ray,*HistoryofChemistryinAncientandMedievalIndia*,IndianChemical Society, 1956.
5. O.P.Jaggi,*HistoryofScienceandTechnologyinIndia(Vol.1–12)*,AtmaRam& Sons, 1970.
6. DebiprasadChattopadhyaya,*HistoryofScienceandTechnologyinAncientIndia*, Firma KLM, 1986.

E-Resources/ MOOCs

1. NPTEL:IndianKnowledgeSystem– IITKharagpur(https://nptel.ac.in)
2. SWAYAM:HistoryofScienceandTechnologyinIndia– UGC
3. INSADigitalRepository(https://insa.nic.in)–ResourcesonIndianChemistry

Swami Ramanand Teerth Marathwada University,Nanded

Faculty of Science & Technology

Name of theProgram	B.Sc.(Industrial Chemistry),ThirdYear (Theory)
Title of thePaper/Course	Industrial Organic & Inorganic Chemistry (SICET-1301)
Year of Implementation	AcademicYear2026–2027
Semester	V
PaperType	ElectiveCore
Credits	02
Total Hours	30 Hours
Formative Assessment Marks	20
SummativeAssessment Marks	30
Total Marks	50

Course Objectives

1. To develop understanding of Structure of Organic Molecule.
2. To impart knowledge of quantitative estimation methods for elements present in organic compounds.
3. To familiarize students with principles and applications of Reaction Mechanism of organic Reaction.
4. To understand the formation of carbon–carbon and carbon–heteroatom bonds through important organic reactions.
5. To introduce Alkene ,Alkynes, Alkyl Halides & Alcohols.
6. To provide knowledge ofstructure,classification,and reactions of Organometalic Compounds

CourseOutcomes(COs)

CO No.	Course Outcome	Bloom's Level	PO Mapping
CO1	Identify organic compounds using preliminary and functionalgroupanalysis.	Understand	PO1,PO2
CO2	Perform Reaction Mechanism of Alkenes, Alkynes ,alcoholes	Apply	PO2,PO4
CO3	Explain mechanisms of carbon–carbon and carbon–Hetero atom bond formation.	Analyze	PO3,PO10
CO4	Apply Variou Organometalic Reagents like Gringnard ,Organo Lithium Etc.	Apply	PO4,PO5

DetailedSyllabus Industrial Organic & Inorganic Chemistry

(SICET-1301)

Module No.	Unit No.	Topic	Hrs.
1.0		**Structure of Organic Molecules**	**08**
	1.1	Introduction ,Types of Bonds in Organic Compounds, Electronic Configuration of Various Organic Compounds	
	1.2	Resonance Concept, Rules Governing Resonance.	
	1.3	Dipole-Dipole Interaction.	
	1.4	Hydrogen Bonding in organic Compound, Effect of Hydrogen Bonding.	
2.0		**Organic Reaction Mechanism**	**07**
	2.1	Introduction, Inductive Effect, Mesomeric Effect.	
	2.2	Homolytic & Heterocyclic Fission.	
	2.3	Carbon Free Radicals, Carbenes, Classification of Reagents.	
	2.4	Types of Mechanism, Activation Energy,Mechanism of Substitution Reaction,Mechanism of Elimination Reaction.	
3.0		**Alkene ,Alkyne & Alkyl Halides,Alcohols**	**07**
	3.1	Introduction Alkenes, structure ,Methods of Preperation,Physical Properties,Chemical Properties	
	3.2	Alkynes, structure ,Methods of Preperation, Physical Properties,Chemical Properties	
	3.3	Alkyl Halides structure ,Methods of Preperation,Physical Properties, Chemical Properties.	
	3.4	Alcohols structure ,Methods of Preperation,Physical Properties,Chemical Properties.	
4.0		**Organo Metalic Compounds**	**08**
	4.1	Introduction.	
	4.2	Various Reaction of Gringnard Reagents	
	4.3	Various Reaction of Organo Lithium Compounds Reagents.	

	4.4	Various Reaction of Organo copper Reagents.	
		Total	**30**

TotalHours:30

References

1. OrganicChemistry,JonathanClayden,NickGreeves,StuartWarren,2ndEdition.
2. PrinciplesofOrganicSynthesis,R.O.C.Norman, J.M.Coxon, 3rdEdition.
3. AdvancedOrganicChemistry,R.Bruckner.
4. OrganicChemistry,G.M.Loudon,4thEdition.
5. OrganicChemistry,R.T.Morrison,R.N.Boyd,S.K.Bhattacharjee,7thEdition.
6. OrganicChemistryVolume2,I.L.Finar,5thEdition.
7. ,V.K.Ahluwalia,S.Dhingra,University Press
8. Principle of Inorganic Chemistry By Puri Sharma Kalia

SwamiRamanandTeerthMarathwadaUniversity,Nanded

Faculty of Science & Technology

Name of theProgram	B.Sc.(Industrial Chemistry),ThirdYear (Practical)
Title of thePaper/Course	Practical Course Industrial Organic & Inorganic Chemistry (SICEP-1301)
Year of Implementation	AcademicYear2026–2027
Semester	V
PaperType	ElectiveCorePractical
Credits	02
Total Hours	60 Hours
Formative Assessment Marks	20
SummativeAssessment Marks	30
Total Marks	50

Course Objectives

1. **To develop practical skills in systematic qualitative analysis** of organic compounds, Preparative Organic Chemistry
2. **To enable students to perform organic synthesis reactions** and understand reaction mechanisms involved in the preparation of compounds like acetanilide, chalcone, and dibenzalacetone.
3. **To familiarize students with purification techniques** such as distillation and extraction used in organic chemistry laboratories and industries..
4. **To provide knowledge of classical organic reactions and transformations**, such as dehydration, condensation, and epoxidation reactions.
5. **To enhance experimental accuracy, observation, and reporting skills** through systematic laboratory work.
6. **To prepare students for industrial applications and competitive examinations** by strengthening laboratory competence and problem-solving ability in organic chemistry.

Course Outcomes

CO No.	Course Outcome	Bloom's Level	PO Mapping
CO1	Perform experiments of Preparative Organic chemistry.	Apply	PO3,PO4
CO2	Apply chromatographic techniques for separation and Identification.	Apply	PO4,PO5
CO3	Carry out organic synthesis reactions and purification Techniques.	Apply	PO3,PO4
CO4	Analyze experimental results and interpret chemical behavior.	Analyze	PO3,PO4

List of Experiments

Sr. No	PracticalExercises	Hrs. Required to cover the contents
1 -	Some General technique of Preparative Organic Chemistry.	4
2	Preparation of Dibenzalacaetone	4
3	Preparation of Pthalamide	4
4	Preparation of Coumarine.	4
5	Preparation of Benzalacetophenone.	4
6.	Preparation of one Chloro 2,4 Dinitrobenzene.	4
7.	To study the Thin Layer Chromatography.	4
8	To study paper Chromatography.	4
9	Preparation of Methyl Salicylate.	
10	Preparation of Benzyle Aceate.	4
11	Preparation of Methyl Benzoate.	
12.	Preparation of Benzyl azo-Beta Napthol	4
13.	Preparation of Iodoforme reaction	4
14.	Preparation of Benzilic Acid Reaarangement	4
15.	Industrial Visit	4
	Total	**60**

Referance Books:

1. Vogel'sTextbookofPracticalOrganicChemistry,B.S.Furniss,A.J.Hannaford,P.W. G.Smith,Pearson,2012.
2. Comprehensive PracticalOrganicChemistry,V.K.Ahluwalia,S.Dhingra,University Press.
3. PracticalOrganicChemistry,F.G.Mann,B.C.Saunders,3rdEdition,Longman,197
4. Advanced Practical Chemistry By R.Mukhopadhyay P.Chaterjee

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science & Technology

Name of theProgram	B.Sc.(Indusrial Chemistry),ThirdYear (Theory)
Title of thePaper/Course	Application-Based Industrial Analytical Chemistry (Theory) [**SICET1302**]
Year of Implementation	AcademicYear2026–2027
Semester	V
PaperType	Elective
Credits	TheoryCredits–2
Total Hours	30 Hours
Formative Assessment Marks	20
SummativeAssessment Marks	30
Total Marks	50

Course Objectives

1. To provide fundamental knowledge of analytical techniques used in real-life applications.
2. To develop skills in chemical analysis of environmental, pharmaceutical, Food, and industrial samples.
3. To understand the principles and applications of modern instrumental methods in analytical chemistry.
4. To enhance problem-solving ability and research-oriented thinking among students.

CourseOutcomes(COs)

Aftercompletingthiscourse, studentswillbeableto:

CO No.	Course Outcome	Bloom's Level	PO Mapped
CO1	Explain the principles and types of analytical techniques Used in environmental and industrial analysis.	Understand	PO1,PO2
CO2	Apply qualitative and quantitative analytical methods for realsa mple analysis.	Apply / Analyze	PO3,PO4
CO3	Describe the working principles and applications of modern Analytical instruments.	Understand/ Analyze	PO2,PO4
CO4	Interpret analytical data and prepare systematic laboratory reports.	Analyze / Evaluate	PO5,PO6

Detailed Syllabus : Industrial Analytical Chemistry (Theory) [**SICET1302**]

Unit No.	UnitTitle	Topics	Hours
I	**Fundamentals of Analytical Chemistry (Application Perspective)**	Types of analysis: qualitative and quantitative; sampling techniques and sample preparation; errors in analysis (types, accuracy, precision); calibration and standardization; quality assurance and quality control (QA/QC).	**07**
II	**Environmental Analysis**	Analysis of water: pH,hardness,alkalinity,DO,COD,BOD; soil analysis: pH, nutrients (NPK), organic matter; air pollutionanalysis:particulatematterandgaseouspollutants; Waste water treatment and analysis.	**08**
III	**Food and Pharmaceutical Analysis**	Food adulteration and its detection; analysis of milk, oils, sugar, and spices; basic concepts of drug analysis; chromatographictechniquesinpharmaceuticals(TLC, HPLCbasics);quality control in food and drug industries.	**07**
IV	**Instrumental Methods in Analytical Chemistry**	UV-Visible spectroscopy: principle and applications; flame photometry; atomic absorption spectroscopy (AAS): basic concept; chromatography: TLC, GC, HPLC (principles and applications);electroanalyticalmethods:pH-metryand potentiometry.	**08**

TotalHours:30

RecommendedTextbooks

1. Vogel, *Textbookof QuantitativeChemicalAnalysis*,Pearson.
2. Skoog,Holler&Crouch,*PrinciplesofInstrumentalAnalysis*, CengageLearning.
3. Willard,Merritt&Dean,*InstrumentalMethodsof Analysis.*
4. R.D.Braun,*IntroductiontoInstrumental Analysis.*
5. A.K.De,*EnvironmentalChemistry*,NewAgeInternational.

E-Resources/ MOOCs

1. **SWAYAM /NPTELCourseson AnalyticalChemistry**
2. **e-PGPathshala–EnvironmentalandInstrumentalAnalysisModules**

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Faculty of Science & Technology

Nameofthe Program	B.Sc.(Industrial Chemistry),Thirdyear(Practical)
Titleofthe Paper/Course	**Application-Based Industrial Analytical Chemistry (Practical)** [SICEP1302]
YearofImplementation	AcademicYear2026-27
Semester	V
PaperType	Elective
Credits	PracticalCredits-2
TotalHours	60
FormativeAssessment Marks	20
SummativeAssessment Marks	30
TotalMarks	50

CourseOutcomes (COs)
Aftercompletingthiscourse, studentswillbeableto:

CO No.	Course Outcome	Bloom's Level	PO Mapped
CO1	Perform basic environmental analysis such as hardness,DO, BOD, and ion estimation in water samples.	Apply	PO3,PO4
CO2	Analyze food samples for adulterants,vitamin content,and sugar Estimation using standard methods.	Apply / Analyze	PO3,PO4
CO3	Operate and calibrate analytical instruments such as pH meter And perform colorimetric analysis.	Apply	PO4,PO5
CO4	Apply chromatographic and conductometric techniques for Qualitative and quantitative analysis.	Analyze /Apply	PO4,PO6

ListofExperiments(Any10)

1. To determine the to talhardness ofthe givenwatersample.
2. To determine the dissolved oxygen (DO)andbiological oxygendemand(BOD)of the given water sample.
3. To estimate the chloride and sulphate content in the given water sample.
4. TodeterminethepHand nutrientstatusofthegivensoilsample.
5. To detect common adulterants in milk,ghee,and edible oil samples.
6. To estimate the vitamin C content in the given fruit juice sample.
7. To determine the sugar content in the given sample.
8. TocalibratethepH meter using standard buffer solutions.
9. To estimate the concentration of iron/phosphate in the givensample by colorimetric method.
10. To separate organic compounds by thin layer chromatography(TLC).
11. To determine the concentration of the given solution by conductometric titration.

TotalHours:60

RecommendedTextbooks

1. Vogel,*TextbookofQuantitativeChemicalAnalysis*
2. Skoog,Holler&Crouch,*PrinciplesofInstrumental Analysis*
3. Willard,Merritt&Dean,*InstrumentalMethodsof Analysis*
4. R.D.Braun,*IntroductiontoInstrumental Analysis*
5. A.K. De,*Environmental Chemistry*

E-Resources/MOOCs

1. **SWAYAM/NPTEL** – AnalyticalChemistryCourses
2. **e-PGPathshala**–EnvironmentalandInstrumentalAnalysisModules

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Faculty of Science and Technology

AcademicYear: 2026–2027

Name of theProgram	B.Sc.(Industrial Chemistry)
Title of thePaper/Course	Dyes Dyes & Intermediates[SICVSC-1201]
Year of Implementation	AcademicYear 2026–2027
Semester	V
PaperType	PracticalbasedVSC
Credits	02
Total Hours	60 Hours
Formative Assessment Marks	20
SummativeAssessment Marks	30
Total Marks	50

CourseObjectives

1. **Knowledge-based:**
   Learn the classification of dyes (natural, synthetic, reactive, disperse, vat, etc.)

2. **Skill-based:**
   To Study the chemical structure and properties of dyes

3. **Application-based:**
   Understand how dyes interact with different fibers (cotton, wool, silk, polyester)..

4. **Research-oriented:**

CourseOutcomes(COs)

CO No.	CourseOutcome Statement	Bloom's Level	PO Mapped
CO1	Describe the fundamental principles and concepts of Dyes	Remember/ Understand	PO1
CO2	Explain various fiber properties that affect dye absorption and fastness .	Understand	PO2
CO3	Apply Learn various dyeing methods (batch, continuous, exhaust, pad dyeing)	Apply	PO3
CO4	Analyze Understand process parameters like temperature, pH, and time	Analyze	PO4

Detailed Syllabus: Drug & Drug Intermediates [SICVSC-1201]

Module No.	Unit No.	Topic	Hrs. Requiredto cover the contents
1.0		**Sulphanamide**	**15**
	1.1	Introduction , Sulphanamide for general Infection,	
	1.2	Sulphanamide for general Infection.	
	1.3	Sulphanamide for urinary infection.	
	1.4	Sulphanamide for Intestine infection.	
2.0		**Antipyritics & Analgesic**	**15**
	2.1	Introduction	
	2.2	Aniline & Para amino phenol analogous	
	2.3	Salicylic acid Anlogous.	
	2.4	Quinoline Derivetives.	
3.0		**Arsenical Drugs**	**15**
	3.1	Introduction	
	3.2	Salverson 606	
	3.3	Atoxyl	
	3.4	Trypersamide	
4.0		**Antiviral & Antibiotics**	**15**
	4.1	Introduction	
	4.2	Plasmoquin, Mepacrine,Choroquine,	
	4.3	Penicillins.	
	4.4	Chloromycetin, Streptomycine	
		Total	**60**

ReferenceBooks:

1. A.I.Vogel– *PracticalOrganicChemistry*
2. Bansal–*LaboratoryManualofOrganicChemistry*
3. N.K. Vishnoi–*AdvancedPracticalOrganic Chemistry.*
4. Text Book of Synthetic Drugs by Jyoti Kumar sonali publication New Delhi

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Faculty of Science & Technology

Name of theProgram	B.Sc.(Industrial Chemistry),ThirdYear
Title of thePaper/Course	Field Project in Industrial ChemistrySICFP-1301
Year of Implementation	AcademicYear2026–2027
Semester	V
PaperType	Field Project In Industrial Chemistry
Credits	4
Total Hours	120 Hours
Formative Assessment Marks	40Marks
SummativeAssessment Marks	60Marks
Total Marks	100Marks

CourseDescription:

The **Field Project (FP)** provides practicalexposure to **chemical industries, laboratories, water treatment plants, pharmaceutical units, and environmental monitoring sites**. Students study **industrial chemical processes, analytical techniques, environmental aspects, and safety practices**under realworkingconditions, therebybridgingthegapbetweentheoreticalknowledge and industrial applications.

CourseOutcomes(COs):

Aftercompletingthiscourse, studentswillbeableto:

CO No.	Uponcompletionofthiscourse,students willbe ableto:	Bloom'sLevel	PO Mapped
CO1	Describe industrial chemical processes and operations inrealenvironments.	Remember/Understand	PO1,PO2
CO2	Apply sampling and analytical techniquesf or chemical analysis of water,soil,and industrial samples.	Apply/Analyze	PO3,PO4
CO3	Analyze data related to chemical composition, Process parameters,and environmental impact.	Evaluate	PO5
CO4	Prepare and present scientific reports basedon Field observations and analytical findings.	Apply/Create	PO6,PO7

DetailedSyllabus:

Unit No.	UnitTitle	Topics	Hours
I	Field Visit & Industrial Exposure	Study of chemical industries& Industrial Chemical Products, Flow Sheet, laboratories,water treatment plants,and environmental sites; understanding raw materials, processes,safety measures,and industrial operations.Plant Layout & Plant Location	15

II	Data Collection &Process Study	Recording observations on raw materials, chemical reactions, process conditions, instrumentation, and environmental parameters.	15
III	Sampling & ChemicalAnalysis	Collection and analysis of sample such as water,soil, effluents,and industrial products using standard analytical Methods	15
IV	ProjectWork& Report Writing	Data interpretation, process evaluation, problem identification,andpreparationofadetailedscientificreport Including methodology,results,and conclusions.	15

Total Hours: 60

RecommendedTextbooks:

1. Austin,G.T. *Shreve's Chemical Process Industries*,McGrawHill.
2. Rao, G. N.,*Outlines of ChemicalTechnology*,East-WestPress.
3. B.K.Sharma Industrial Chemistry .

E-Resources /MOOCs:

1. NPTEL–IndustrialChemistry&ChemicalTechnology
2. SWAYAM– EnvironmentalChemistry& AnalyticalTechniques

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Faculty of Science & Technology

Name of the Program	B.Sc. (Industrial Chemistry),ThirdYear (THEORY)
Title of the Paper/ Course	Unit Processes of Inorganic Chemistry SICCT-1351
Year of Implementation	AcademicYear2026–27
Semester	VI
Paper Type	CoreMajor
Course Code	SICCT-1351
Credits	03
Total Hours	45
Formative Assessment Marks	30
Summative Assessment Marks	45
Total Marks	75

Courseobjectives:

1. To understand the industrial importance of **Ammonia** and **Urea**
2. To study their physical and chemical properties
3. To learn various manufacturing methods (e.g., Haber process for ammonia, urea synthesis process)
4. To analyze process flow sheets and perform material balance calculations.
5. To understand the production and industrial significance of **Sucrose** and **Ethanol**
6. To study their physical and chemical properties 7
7. To learn manufacturing processes (sugar manufacturing from cane, fermentation for ethanol)
8. To understand the industrial role of **Sulphur** and **Sulphuric Acid**
9. To study their properties and applications
10. To learn manufacturing methods (e.g., Contact process for sulphuric acid)
11. To analyze process flow diagrams and perform material balances
12. To study plant design, location, and layout considerations.

CourseOutcomes(COs)

After completing this course, students will b eable to:

CO No.	CourseOutcomeStatement	Bloom'sLevel
CO1	Know the importance synthesis of ammonia ,Nitric acid & Urea	Remember/ Understand
CO2	Explain the Various Industrial Methods of reduction of Nitro Compounds to Amine. .	Apply
CO3	Understand the classification ,study Sugar & Ethanol .	Analyze
CO4	Study the of the various Polymer Industry. .	Evaluate

DetailedSyllabus: Unit Processes of Inorganic Chemistry SICCT-1351

Module No.	Unit No.	Topic	Hrs. Requiredto cover the contents
1.0		**Ammonia & Urea.**	10
	1.1	Introduction. Physical & Chemical Properties	
	1.2	Selection of Manufacturing Methods.	
	1.3	Flow Sheets ,Material Balance.	
	1.4	Plant Location & Plant Layout.	
2.0		**Sugar & Ethanol.**	10
	2.1	Introduction. Physical & Chemical Properties	
	2.2	Selection of Manufacturing Methods.	
	2.3	Flow Sheets ,Material Balance.	
	2.4	Plant Location & Plant Layout.	
3.0		**Sulphur & Sulphuric Acid**	10
	3.1	Introduction. Physical & Chemical Properties	
	3.2	Selection of Manufacturing Methods.	
	3.3	Flow Sheets ,Material Balance.	
	3.4	Plant Location & Plant Layout.	
4.0		**Polyvinyl Chloride , Polyethylene & Polystyrene**	15
	4.1	Introduction. Physical & Chemical Properties	
	4.2	Selection of Manufacturing Methods.	
	4.3	Flow Sheets ,Material Balance.	
	4.4	Plant Location & Plant Layout.	
		Total	45

Total Hours: 45

RecommendedTextbooks .

1. Outlines Of Chemical technology By Gopl Rao.
2. Comprensive Industrial Chemistry By Prakash G More
3. Industrial Chemistry By B.K.Sharma

E-Resources/ MOOCs

1. NPTEL
2. SWAYAM
3. e-PGPathshala
4. Virtual Labs for spectro scopy and structural elucidation.

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Faculty of Science &Technology

Name of theProgram	B.Sc.(Industrial Chemistry),ThirdYear
Title of thePaper/Course	Industrial Spectroscopy (Theory)SICCT-1352
Year of Implementation	AcademicYear2026–27
Semester	VI
PaperType	CoreMajor
Credits	03 (Theory)
TotalHours	45 Hours
Formative Assessment Marks	30Marks
Summative Assessment Marks	45Marks
Total Marks	75Marks

CourseObjectives

Course Outcomes(COs):

CO1 Learn the basic principle and terms used in UV, IR & NMR Spectroscopy.
CO2 Apply spectroscopic techniques in analyzing the structure of simple organic molecules.
CO3 Apply spectroscopic techniques in analyzing the structure of simple organic Molecule.
CO4 Analyze UV spectra to determine conjugation and electronic transitions
CO5Interpret IR spectra to identify functional groups
CO6Analyze NMR spectra (^{1}H and ^{13}C) for structural information
CO7Interpret mass spectra to determine molecular weight and fragmentation patterns.

CourseOutcomes (COs)

Aftercompletingthiscourse, studentswillbeableto:

CO No.	Course Outcome	Bloom'sLevel	PO Mapped
CO1	Explain concepts Electromagnetic Spectrum & UV Spectroscopy.	Remember/ Understand	PO1,PO2
CO2	Students can Gain Knowledge about IR Spectroscopy.	Apply/Analyze	PO3,PO4
CO3	Students can lear abou various ananlysis method used in R&D unit in Industry.	Analyze	PO2,PO4
CO4	Students can learn about the NMR Spectroscopy .	Evaluate	PO5
CO5	Students taking knowledge about Mass Spectrometry.	Understand	PO1,PO2
CO6	Students can easily handle various Instruments like UV, IR,NMR,Mass Spectrometer .	Apply/Create	PO6,PO7

Detailed Syllabus : Industrial Spectroscopy (Theory)SICCT-1352

Module No.	Unit No.	Topic	Hrs. Requiredto coverthe contents
1.0		**Ulltraviolet Spectroscopy**	**12**
	1.1	Introduction	
	1.2	Absorption Laws	
	1.3	Instrumentation	
	1.4	Absorption & Intensity Shift & numericals..	
2.0		**Infrared Spectroscopy**	**11**
	2.1	Introduction	
	2.2	Principals of IR Spectroscopy , Theory of Molecular Vibrations	
	2.3	Instrumentation.	
	2.4	Vibrational Friquency & numericals..	
3.0		**NMR Spectroscopy**	**12**
	3.1	Introduction	
	3.2	Numbers of Signals	
	3.3	Instrumentation.	
	3.4	Position of Signals & numericals..	
4.0		**Mass Spectroscopy**	**10**
	4.1	Introduction	
	4.2	Basic Principals ,Instrumentation	
	4.3	Important Features of Mass Spectra of Hydrocarbons.	
	4.4	Aromatic Compounds & numericals.	
		Total	**45**

RecommendedTextbooks

1. PhysicalChemistrybyG.M.Barrow(TataMc-Graw HillpublishingCo.,Ltd.)
2. ElementsofPhysicalChemistrybyS.Gladstone &D.Lewis(D.vannostrandco.inc.)
3. PhysicalChemistrybyW.J.Moore(OrientLongman).
4. PrinciplesofPhysicalChemistrybyS.H.Maronand C.F.Prutton.
5. UniversityGeneralChemistrybyC.N.R.Rao(McMillan).
6. ElementsofPhysicalChemistrybyP.W.Atkins.(Oxford UniversityPress).
7. PhysicalChemistrybyR.A.Alberty(WileyEasternLtd.).
8. PhysicalChemistrythroughproblemsbyS.K.Dogra,D.Dogra(WileyEastern Ltd)
9. PrinciplesofPhysicalChemistrybyPuri,SharmaandPathania(VishalPublicationJalandhar, Delhi)
10. PhysicalChemistrybyA.J.Mee.ELBS&HeinemannEducationalBooksLtd.
11. EssentialsofPhysicalChemistrybyArunBhal,B.S.Bahland G.D. Tuli.(S.Chand)
12. KineticsbyK.J.Laidler (TataMc-GrawHillPublishing Co.Ltd).
13. TextBookofPhysicalChemistrybySoni-Dharmarha.
14. ATextBookPhysicalChemistrybyS.Glasstone,(Mac Millan.)
15. AdvancedPhysicalChemistrybyD.N.Bajpai.(S. Chand)
16. AdvancedPhysicalChemistrybyGurdeep Raj.(Goelpublishing house,Meerut)
17. Spectroscopy of organic compounds by P.S.Kalsi
18. Elementary organic absorption spectroscopy by Y.R.Sharma
19. .Absorption spectroscopy of organic molecules by V.M.Parikh
20. Chemistry of pesticides by K.H.Buchel

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Name of the Programme	B.Sc.(Industrial Chemistry),ThirdYear
Title of the Paper/ Course	Industrial Inorganic Chemistry (SICCT1353)
Year of Implementation	AcademicYear2026–2027
Semester	VI
PaperType	(SICCT1353)
Credits	02
TotalHours	30Hours (Theory)
FormativeAssessmentMarks	20
SummativeAssessmentMarks	30
TotalMarks	50

Course Objective:

1. Student Know about bonding in various molecules.
2. Students Know about metal ligand Charge Transfer
3. Students know about metal ligand complexes and their uses in catalyst.
4. Students aware about Metal Industry & formation of alloy.

CourseOutcomes (COs)

Aftercompletingthiscourse, studentswillbeableto:

CO No.	Course Outcome	Bloom's Level	PO Mapping
CO1	Explain and apply various Chemical Bonding Ionic Bond, Covalaent Bond	Understand	PO1,PO2
CO2	Select and apply suitable Hybridization of Various Organic Compound	Apply	PO2,PO4
CO3	Design synthetic routes using Metal ligand Transition Complexes	Analyze	PO3,PO10
CO4	Apply concept of Metal & Metalargy.	Apply	PO4,PO5

DetailedSyllabus: Industrial Inorganic Chemistry(SICET1353)

Module No.	Unit No.	Topic	Hrs. Requiredto cover the contents
1.0		**Chemical Bonding**	**8**
	1.1	Ionic Bond	
	1.2	Covalent Bond	
	1.3	Electronic configurations of Homo nuclear Diatomic Molecules.	
	1.4	Bond order of Homo & Hetero nuclear Diatomic molecules	
2.0		**Hybridization & Shape of Covalent Molecule.**	**7**
	2.1	Sp,SP^2,SP^3 Hybridization.	
	2.2	VSEPR Theory.	
	2.3	Geometry of Covalent molecule.	
	2.4	Geometry of Ions.	
3.0		**Metal –Ligand Bonding in Transition Metal Complexes**	**8**
	3.1	Introduction.	
	3.2	Limitation of Valence.Bond Theory,An Elementary idea of crystal Fluid Theory.	
	3.3	Crystal Fluid Spliting in Octahydral, Tetrahydral & Square Planar Complexes.	
	3.4	Factor Affecting Crystal Field Parameters.	
4.0		**Metal & Metalargy**	**7**
	4.1	Introduction & Occurance of Metals	
	4.2	Concentrations of Ores.	
	4.3	Calcination, Roasting	
	4.4	Smelting,Reduction of Metal Oxide by Carbon.& Refining.	
		Total	**30**

TotalHours:30

RecommendedTextbooks

1. Inorganic Chemistry By Puri Sharma Kalia.
2. Industrial Chemistry By B.K.Sharma
3. Chemistry for Degree Students K.L.Madan

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Name of theProgram	B.Sc.(Industrial Chemistry)
Title of the Paper/Course	(Practicalbased on) [SICCP1351]
Year of Implementation	AcademicYear 2026–2027
Semester	VI
PaperType	DSC(Practical)basedonSICCT1351+ SICCT1353
Credits	02
Total Hours	60 Hours
Formative Assessment Marks	20
SummativeAssessment Marks	30
TotalMarks	50

Course Objectives

1. **To develop practical skills** Unit Processes & Unit Operation used in Synthesis Industry reagents and techniques.
2. **To understand reaction mechanisms** and perform organic preparations such as acetylation, nitration, bromination, condensation, and rearrangement reactions.
3. **To train students in purification andcharacterization techniques**,including recrystallization, melting point determination, and Thin Layer Chromatography (TLC).
4. **To develop analytical skills** in preparation of organic derivatives for identification of unknown compounds.
5. **To enhance volumetric analysis skills** for quantitative estimation of metals in ores and minerals.
6. **Topromotelaboratorysafety,accuracy,andscientificreporting**,encouraging research-oriented thinking and data interpretation.

CourseOutcomes(COs)

Aftercompletingthiscourse, studentswillbeableto:

CO No.	Uponcompletionofthiscourse,studentswillbeableto:	Bloom's Level	PO Mapped
CO1	Perform Industrial Unit Proscesses Raw Material Material Balance	Apply	PO3,PO4
CO2	To study The Manufacturing Process	Apply/ Analyze	PO3,PO4
CO3	To study the Plant Lay Out Plant utilities.	Analyze	PO2,PO4
CO4	To Industrial Process Methods of Production.	Apply	PO3,PO5

DetailedSyllabus: SICCP1351:PracticalBasedonICCT1351

Sr. No	PracticalExercises	Hrs. Required to cover the contents
1.	Diels –Alder Reaction	4
2.	Synthesis of P-Chlorotoluene fromP- Toludine	4
3.	Preparation of Mohr'S Salt	4
4.	Estimation of Calcium in CAN- Fertilizer	4
5.	Analysis of Ar grade & LR Grade HCl.	4
6.	Assay of Glacial Acetic Acid	4
7.	Deionization of Water using Ion Exchange resin of Zeolite.	4
8.	Preparation of Sulaphanilic acid from Aniline.	4
9.	Preparation of 2,4Dihydroxy Ethyl benzene From 2,4 Dihydroxy Acetophenone	4
10.	To Prepare O Chloro Benzoic acid From Pthalamide.	4
11.	Synthesis of Dibezenal acetone from Beanzaldehyde.	4
12.	Preparation of P-Xylene 2 Sulphonic acid	4
13.	Preparation of P-Chloro benzoic acid from Anthranilic acid	4
14.	Preparation of Phenyl Azo-2-Napthol	4
15.	Industrial Visit	4
	Total	**60**

TextBooksandReferenceBooks:

1Principles of Inorganic Chemistry by Puri, Sharma and Kalia.
2 Inorganic Chemistry by Gurudeep Raj, Chatwal.
3. Practical Organic Chemistry By Dr V.P.Sharma Pragati Prakashan.
4.Elementary Practial Organic Chemistry by Arthur .I. Vogel Peorson Prakashan.
5.Industrial Chemistry Practical By Nirali Prakashan.
5.Industrial chemistry by B.K.Sharma
6.Outlines of Chemical technology by Gopal Rao.

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Faculty of Science & Technology

ProgrammeDetails

Name of the Programme	B.Sc.(Industrial Chemistry),ThirdYear
Title of the Paper/ Course	(SICCP-1353)
Course Code	(SICCP-1353)
Year of Implementation	AcademicYear2026–2027
Semester	VI
PaperType	Practical
Credits	02
Total Hours	30 Hours
FormativeAssessment Marks	20
SummativeAssessment Marks	30
Total Marks	50

Course Objectives

Sr.No.	Course Objectives
1	To develop practical skills in performing oxidation Gravimetrivc Analysis.
2	To study Industrial Process like Schiff Base.
3	To Study & Develop Practical Skill of Metal Complexes .
4	To familiarize students with reaction onditions,reagents,andmechanismsinvolved in Inorganic transformations.
5	To develop skills in observation, analysis, and interpretation of experimental results.

Course Outcomes(COs)

Aftercompletingthiscourse,studentswillbeableto:

CO No.	Course Outcome	Bloom's Level	PO Mapping
CO1	Perform for transformationof inorganic Gravimetric estimation of Iron as Fe2O3	Apply	PO3,PO4
CO2	Preparation of Metal Complexes.	Apply	PO3,PO4
CO3	Gravimetric estimation of zinc as ZnO.	Apply	PO3,PO4
CO4	Preparation of Schiff Base..	Analyze	PO3,PO4

DetailedSyllabus/List of Experiments : SICCP-1353

Sr. No	PracticalExercises	Hrs.Required to cover the contents
1.	Gravimetric estimation of Iron as Fe_2O_3	4
2.	Preparation of Schiff Base.	4
3.	Gravimetric estimation of Ba as BaSO4 3	4
4.	Preperation of Metal Complexes.	4
5	estimation of Nickel as Ni(DMG)2	4
6	Gravimetric estimation of zinc as ZnO	4
7.	Gravimetric estimation of Aluminium as Al(Oxinate)	4
8	Gravimetric estimation of Chloride as AgCl	4
9.	Preperation of Metal Complexe [Cu(NH3)4]SO4	4
10.	Preperation of Metal Complexe [Ni(NH3)6]Cl2	4
11	Preperation of Metal Complexes $[CoCl_2.(NH3)_4]Cl$	4
12	Preperation of Metal Complexe Sodium trioxalato ferrate	4
13.	Preperation of Metal Complexes $K_2[Co(SCN)_4]$.	4
14.	Preparation of [FeSO4(NH4)2SO4].6H2O	4
15.	Industrial Visit	4
	Total	**60**

1. Advanced Practical Chemistry-R.Mukhopadhyay & P.Chaterjee.
2. Advanced Practicals in Chemistry -Gurudeep Raj.
3. Experiments in Chemistry –D.V.Jahagirdar.
4. Vogels textbook of Practial Inorganic Chemistry.

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Name of theProgram	B.Sc.(Indusrial Chemistry)
Title of thePaper/Course	Industrial Physical Chemistry (Practical)[SICCP1352]
Year of Implementation	AcademicYear 2026–2027
Semester	VI
PaperType	CoreMajor Practicalbasedon SICCT1352+SICCT1353
Credits	02
Total Hours	60 Hours
FormativeAssessment Marks	20
Summative Assessment Marks	30
TotalMarks	50

Course Objectives

1. **To develop practical skills** in the synthesis ofc oordinationcompoundsusingappropriate laboratory techniques.
2. **To understand the principles of coordination chemistry**,including ligandbehavior, coordination number, and complex formation.
3. **To train students in purification and characterization** ofinorganic complexes through crystallization and analytical methods.
4. **To determine the percentage purity**ofsynthesizedcomplexesusingquantitative analysis.
5. **To introduce Schiff's base complexes** and their significance in coordination chemistry and industrial applications.
6. **To enhancelaboratoryskills**,accuracy,safetypractices,andscientificreportingin inorganic experimental work.

CourseOutcomes(COs)

Aftercompletingthiscourse, studentswillbeableto:

CO No.	Uponcompletionofthiscourse,studentswillbeableto:	Bloom's Level	PO Mapped
CO1	Synthesize coordination compounds such as Prussian blue, oxalato, ammine,andthioureacomplexesusingstandardlaboratory procedures.	Apply	PO3,PO4
CO2	Explain the principles of coordination chemistry involve din Complex rmation,including ligand coordination and geometry.	Understand	PO1,PO2
CO3	Purify and characterize in organic complexes usingc rystallization And observationaltechniques.	Apply / Analyze	PO3,PO4
CO4	Perform quantitative stimationto determine percentagepurityof synthesizedcomplexes.	Apply / Analyze	PO3,PO5
CO5	Analyzeexperimentalresultsandcorrelatethemwiththeoretical Concepts of coordination chemistry.	Analyze / Evaluate	PO4,PO5
CO6	Demonstrate safe laboratory practices, proper handling of chemicals,andprofessionalethicsinexperimentalwork.	Apply / Create	PO6,PO7

DetailedSyllabus: Practical Based on SICCT1352

Sr. No	PracticalExercises	Hrs. Required to cover the contents
1.	Estimation of Na/ K by flame photometer in a solution/ sample.	4
2.	Estimation of aluminum in bauxite gravimetrically.	4
3.	Determination of calcium in dolomite by flame photometer	4
4.	Determination of magnesium in soil.	4
5.	Electrogravimetric determination of copper in an ore.	4
6.	Estimation Of Chloride in Bleaching Powder.	4
7.	Determination of soil pH.	4
8.	Polarographic determination of trace quantity of lead/ Cadmium/ Zinc in sample solution	4
9.	Determination of concentration of ferrous ion by potentiometric titration.	4
10.	. Determination of Silver in an alloy by Volhard's method	4
11.	Determination of antimony by titration with iodine.	4
12.	Iodometric determination of copper	4
13.	Estimation of ferrous and ferric iron in a mixture.	4
14.	Potentiometeric determination of fluoride in drinking water/ river water using Fluoride- ion selective electrode.	4
15.	Industrial Visit	4
	Total	**60**

1. **Reference Books (Laboratory work):**

1. SystematicExperimentalPhysicalChemistrybyS.W.Rajbhoj,T.K.Chondekar(Anjali publication,Aurangabad)
2. AdvancedPracticalPhysicalChemistrybyJ.B.Yadav(GoelPublication,Meerut)
3. PracticalChemistrybyO.P.Pandey,D.N.Bajpaiand Dr.S.Giri(S.Chand Publications)
4. ExperimentsinChemistry,D.V.Jahagirdar(HimalayaPublishingHouse)
5. AdvancedPhysicalChemistryexperimentsbyGurtuandGurtu(PragatiPublication, Meerut)
6. Senior PracticalPhysicalChemistrybyB. D. Khosla, V. C. Gargand A. Galati(R. Chand and Company, New Delhi)
7. ExperimentsinPhysicalChemistrybyR.C.DasandB.Behra(TataMcGrawHill)
8. ExperimentsinPhysicalChemistry(8^{th}Edn)byC.W.Garland,J.W.NiblerandD.O. Shoemaker (McGraw Hill, New York, 2003)
9. PracticalPhysicalChemistrybyA. Findlay, T.A.Kitchner (Longmans, GreenandCo.)
10. PracticalPhysicalChemistry,VishwanathanandRaghwan,Viva book.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science & Technology

Name of theProgram	B.Sc.(Chemistry)
Title of thePaper/Course	Industrial Physical Chemistry[SICET-1351]
Year of Implementation	AcademicYear 2026–2027
Semester	VI
PaperType	(Elective)
Credits	02
TotalHours	30 Hours
FormativeAssessment Marks	20
SummativeAssessment Marks	30
TotalMarks	50

Objectives:

(i) To understand the scope of Thermodynamics.
(ii) To Study of First Law of Thermodynamics
(iii) To Study & Understand Second Law & Third Law of Thermodynamics.

CourseOutcomes (COs)

CO No.	Course Outcome	Bloom'sLevel	PO Mapped
CO1	Student gain Knowledge about Kinetics & Thermodynamics	Remember/ Understand	PO1,PO2
CO2	Student take the Knowledge Heat Engines	Apply/Analyze	PO3,PO4
CO3	Student get the knowledge about ideal law and sencible Heat effect	Analyze	PO2,PO4
CO4	Student study about Thermodynamic Temperature scale	Evaluate	PO5

DetailedSyllabus: Industrial Physical Chemistry [SICET-1351]

Module No.	Unit No.	Topic	Hrs. Requiredto cover the contents
1.0		**The Scope of Thermodynamics**	**8**
	1.1	Temperature ,Pressure, Work, Energy, Heat,	
	1.2	The First Low & Other basic concepts	
	1.3	Joule's Experiments, Internal Energy	
	1.4	Energy Balance for closed systems ,Thermodynamic state & state functions ,Equilibrium ,The phase rule ,	
2.0		**Volumetric Properties of Pure Fluids**	**7**
	2.1	PVT Behavior of pure substances ,virial Equations of staes ,The Ideal gas,Applications of the virial Equation.	
	2.2	Cubic Equations of states ,Generalized correlations for Gases , Generalized correlations for Liquids ,sensible Heat effects	
	2.3	Latent Heat of pure substances ,standard heat of reactions, standard heat of formations, standard heat	
	2.4	Combustion Temperature dependence of ΔH0 ,Heat effects of Industrial reactions	
3.0		**The Second Law of Thermodynamics**	**8**
	3.1	Statements of second low, Heat Engines	
	3.2	Thermodynamic temperature Scales Entropy	
	3.3	Biodiversity,Indigenousseedproduction,Farmwasterecycling,	
	3.4	Entropy changes of an Ideal Gas, Mathematical statement of the Second Law,Entropy balance for open Systems , Calculation of Ideal work, Lost Work,	

4.0		**Third Law of thermodynamics**	
	4.1	Entropy from the Microscopic Viewpoint, Property relations for homogeneous phases,	**7**
	4.2	residual properties ,residual properties by Equations of State, Two-Phase	
	4.3	Systems, Thermodynamic Diagrams, Tabels of Thermodynamic properties ,generalized property Correlations for gases .	
	4.4	Numerical	
		Total	**30**

RecommendedTextbooks

1. Puri,Sharma&Pathania –*PrinciplesofPhysical Chemistry*,MilestonePublication
2. Engineering Chemical Thermodynamics.
3. Physical Chemistry By Atkins

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science & Technology

Name of theProgram	B.Sc.(Indusrial Chemistry)
Title of thePaper/Course	Industrial Physical Chemistry (Practical)[SICCP1352]
Year of Implementation	AcademicYear 2026–2027
Semester	VI
PaperType	CoreMajor Practicalbasedon SICCT1352+SICCT1353
Credits	02
Total Hours	60 Hours
FormativeAssessment Marks	20
Summative Assessment Marks	30
TotalMarks	50

Course Objectives

7. **To develop practical skills** in the synthesis ofc oordinationcompoundsusingappropriate laboratory techniques.
8. **To understand the principles of coordination chemistry**,including ligandbehavior, coordination number, and complex formation.
9. **To train students in purification and characterization** ofinorganic complexes through crystallization and analytical methods.
10. **To determine the percentage purity**ofsynthesizedcomplexesusingquantitative analysis.
11. **To introduce Schiff's base complexes** and their significance in coordination chemistry and industrial applications.
12. **To enhancelaboratoryskills**,accuracy,safetypractices,andscientificreportingin inorganic experimental work.

CourseOutcomes(COs)

Aftercompletingthiscourse, studentswillbeableto:

CO No.	Uponcompletionofthiscourse,studentswillbeableto:	Bloom's Level	PO Mapped
CO1	Synthesize coordination compounds such as Prussian blue, oxalato, ammine,andthioureacomplexesusingstandardlaboratory procedures.	Apply	PO3,PO4
CO2	Explain the principles of coordination chemistry involve din Complex rmation,including ligand coordination and geometry.	Understand	PO1,PO2
CO3	Purify and characterize in organic complexes usingc rystallization And observationaltechniques.	Apply / Analyze	PO3,PO4
CO4	Perform quantitative stimationto determine percentagepurityof synthesizedcomplexes.	Apply / Analyze	PO3,PO5
CO5	Analyzeexperimentalresultsandcorrelatethemwiththeoretical Concepts of coordination chemistry.	Analyze / Evaluate	PO4,PO5
CO6	Demonstrate safe laboratory practices, proper handling of chemicals,andprofessionalethicsinexperimentalwork.	Apply / Create	PO6,PO7

DetailedSyllabus: Practical Based on SICET1351

Sr. No	PracticalExercises	Hrs. Required to cover the contents
1.	Estimation of Na/ K by flame photometer in a solution/ sample.	4
2.	Estimation of aluminum in bauxite gravimetrically.	4
3.	Determination of calcium in dolomite by flame photometer	4
4.	Determination of magnesium in soil.	4
5.	Electrogravimetric determination of copper in an ore.	4
6.	Estimation Of Chloride in Bleaching Powder.	4
7.	Determination of soil pH.	4
8.	Polarographic determination of trace quantity of lead/ Cadmium/ Zinc in sample solution	4
9.	Determination of concentration of ferrous ion by potentiometric titration.	4
10.	. Determination of Silver in an alloy by Volhard's method	4
11.	Determination of antimony by titration with iodine.	4
12.	Iodometric determination of copper	4
13.	Estimation of ferrous and ferric iron in a mixture.	4
14.	Potentiometeric determination of fluoride in drinking water/ river water using Fluoride- ion selective electrode.	4
15.	Industrial Visit	4
	Total	**60**

2. **Reference Books (Laboratory work):**

1. SystematicExperimentalPhysicalChemistrybyS.W.Rajbhoj,T.K.Chondekar(Anjali publication,Aurangabad)
2. AdvancedPracticalPhysicalChemistrybyJ.B.Yadav(GoelPublication,Meerut)
3. PracticalChemistrybyO.P.Pandey,D.N.Bajpaiand Dr.S.Giri(S.Chand Publications)
4. ExperimentsinChemistry,D.V.Jahagirdar(HimalayaPublishingHouse)
5. AdvancedPhysicalChemistryexperimentsbyGurtuandGurtu(PragatiPublication, Meerut)
6. Senior PracticalPhysicalChemistrybyB. D. Khosla, V. C. Gargand A. Galati(R. Chand and Company, New Delhi)
7. ExperimentsinPhysicalChemistrybyR.C.DasandB.Behra(TataMcGrawHill)
8. ExperimentsinPhysicalChemistry(8^{th}Edn)byC.W.Garland,J.W.NiblerandD.O. Shoemaker (McGraw Hill, New York, 2003)
9. PracticalPhysicalChemistrybyA. Findlay, T.A.Kitchner (Longmans, GreenandCo.)
10. PracticalPhysicalChemistry,VishwanathanandRaghwan,Viva book.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science & Technology

NameoftheProgram	B.Sc.(Industrial Chemistry),ThirdYear
Title ofthePaper/Course	Introduction to Polymers (Theory)SICET-1352
YearofImplementation	AcademicYear2026–27
Semester	VI
PaperType	Elective
Credits	02 (Theory)
TotalHours	30Hours (Theory)
FormativeAssessmentMarks	20Marks
SummativeAssessmentMarks	30Marks
Total Marks	50Marks

CourseObjectives

Larning Objectives of the Course:

1. The students are expected to learn Polymers-Monomer Functionality,
2. Advantages & disadvantages of Polymers.
3. Natural Polymers & its applications, Classification of Polymers
4. Technics or Methods of polymerisation.

Polymers productions Outcomes of the Course :

:

CO1:	The students understood about the basics of polymers and its classifications.		
CO2:	CO2: The students known about different technics in polymers productions.		
CO3	The students are knowing the different types of polymers productions		
CO4	The students understand Knowledge of Elastomers.		

Unit No.	UnitTitle	Topics	Hours
I	**Introduction to Polymers-**	Monomer Functionality, Advantages & disadvantages of Polymers.Natural Polymers & its applications- Bitumens, Shellac, Cellulose, Rosin,Lignin, Casein, Zein, Natural Rubber.Classification of Polymers- Natural polymers, Semi synthetic polymers,Synthetic polymers, Application and physical properties- Elastomers, Plastics,Fibres. Thermoplastics and Thermosets, Polymer classification based on structure-Linear Polymers, Cross linked polymers, Copolymers, Tacticity,Crystalline and Non crystalline polymers, Addition polymerisation-Initiation,Propogation, Kinetics of Chain Polymerisation, Condensation polymerisation-Kinetidcs of Condensation polymerisation, Comparison between addition and condensation polymerisation. Characteristics of Addition polymerisation,Characteristics of Condensation Polymerisation-Ionic polymerisation ,Cationic polymerisation, Anionic polymersation,	10
II	**Technics or Methods of polymerisation**	Bulk or Mass polymerisation 2. Solution Polymerisation, 3. Suspension Polymersation, 4. Emulsion polymerisation. Molecular Weight and its Determination- Molecular weight, Number Average Molecular Weight, Determination of Molecular weight by viscosity measurement.	08
III	**Polymers productions**	Phenol Formaldehyde Resins- Introduction-Novalac & Resole production, Properties & application.Amino Resins- Urea Formaldehyde production, Properties & Application.. Vinyl polymers-Polystyrene, Polyvinyl Chloride (PVC), PolyvinylAcetate (PVAC), Polyvinyl Alcohol (PVA) its properties &amp applications.	06
IV	**Elastomers-**	Introduction - Polybutadiene Rubber (PB), Styrene-Butadiene Rubber , its properties & Applications. Fibre-Nylon6, 6 & 6,10 , Nylon 6,6 salt	06
	Total		30

ReferenceBooks:

Reference Book: :
1.Polymer Chemistry-Gowarikar
2.. Unit processes in organic synthesis-P.H.Groggins,
3. Study Material-for UGC sponsored vocational course in Industrial Chemistry-1997. Industrial Chemistry (Experimental Study Book-NEP 2020)- Dr.P.S.Mane, MEWADEV GRANTH AVADEMY, 2025

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science & Technology

NameoftheProgram	B.Sc.(Industrial Chemistry),ThirdYear
Title ofthePaper/Course	Practical Introduction to Polymers (SICEP-1352)
YearofImplementation	AcademicYear2026–27
Semester	VI
PaperType	Elective
Credits	02
TotalHours	60Hours (Practical)
FormativeAssessmentMarks	20Marks
SummativeAssessmentMarks	30Marks
Total Marks	50Marks

CourseObjectives(Practical)

1. To develop a clear understanding of **analytical and physical chemistry principles** through laboratory-based experiments involving instrumental and non-instrumental techniques.
2. To train students in the use of **modern analytical instruments** such as conductometer, potentiometer, pH meter, colorimeter, and spectrophotometer for quantitative analysis.
3. To enhance practical skills in performing **titrimetric, electrochemical, spectroscopic, and kinetic experiments** with accuracy and precision.
4. To develop the abilityto **analyze experimental data**, performcalculations, and interpret results in a scientific manner.
5. To provide hands-on experience in studying **reaction kinetics, thermodynamic parameters, and physicochemical properties** such as density, viscosity, and surface tension.
6. To promote safe laboratory practices, **proper handling of chemicals and instruments**, and systematic record keeping.

CourseOutcomes (COs)

CO No.	Course Outcomes	Bloom's Level	PO Mapping
CO1	To perform Experiments of Polymer Clear Synthesisis of Polymer	Apply	PO3,PO4
CO2	To analyse Nylo 66& 6,10 Threads	Analyze	PO2,PO4
CO3	Determinephysicochemicalparameterssuchas**density, viscosity,surfacetension,and distributioncoefficient** Using appropriate experimental methods.	Apply	PO3,PO5
CO4	Investigatereactionkinetics, including **orderofreactionand hydrolysisreactions**,andevaluaterateconstantsusing Experimental data.	Analyze	PO2,PO4

CO5	Evaluatethermodynamicpropertiessuchas**enthalpyof ionizationand hydration** throughlaboratoryexperiments.	Analyze/ Evaluate	PO4,PO5
CO6	Demonstrateproficiencyin**laboratorytechniques,safety practices, and scientific documentation**, and present results systematically.	Apply	PO6,PO7

List ofExperiments

1. Preparation of Nylon 6,6 and 6,10 thread by condensation & Calculate % Yield.
2. Preparation of Novalac & Resole – Thermosetting resin & Calculate % Yield.
3. Preparation of Urea formaldehyde resin & Calculate % Yield.
4. Preparation of Polysulphide rubber (Thiokol) & Calculate % Yield.
5. TofindoutthestrengthofHClandCH$_3$COOHinamixtureofbothbytitratingit against NaOH by using p^H meter.
6. Todeterminetheλmaxofunknown$KMnO_4$/$K_2Cr_2O_7$solutionbycolorimetric measurements.
7. To measure the pH of differentsolutionslike aerated drinks,fruit juices,shampoos and soap using pH-meter.
8. Determinethe concentrationofHClagainst0.1NNaOH spectrophotometrically
5. Tostudythe kineticsofacid hydrolysisofmethyl acetatewith hydrochloric acid.
6. Tostudydistributionofbenzoicacidbetweenwaterandtoluene.
7. Determinationofenthalpyofionizationofaceticacid.
8. To determine the density of different liquids(e.g.ethanol,toluene,carbon tetrachloride, etc.) by using Pyknometer or relative density bottle.
9. Todeterminetheorderofreactionbetween$K_2S_2O_8$andKI byhalf-lifemethod.
10. Determinationofenthalpyofhydrationofcoppersulphate.
11. Todeterminethe parachorofp-chlorobenzenebystalagmometer.
12. Tofindoutthetemperaturecoefficientofthegivenliquidbyusingviscometer.

ReferenceBooks(LaboratoryWork)

1. Rajbhoj&Chondekar–*SystematicExperimentalPhysicalChemistry*
2. J. B. Yadav–*AdvancedPracticalPhysicalChemistry*
3. O.P. Pandeyetal.–*PracticalChemistry*
4. D. V.Jahagirdar– *Experimentsin Chemistry*
5. Gurtu&Gurtu–*AdvancedPhysical Chemistry Experiments*

E-Resources/MOOCs

1. NPTEL –PhysicalChemistryCourses
2. SWAYAM–Undergraduate ChemistryCourses
3. e-PGPathshala –PhysicalChemistryModules
4. VirtualLabs–PhysicalChemistryExperiments

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

Faculty of Science & Technology

NameoftheProgram	B.Sc.(Industrial Chemistry),ThirdYear
Title ofthePaper/Course	Dye & Dye Intermedites,SICVSC-1351
YearofImplementation	AcademicYear2026–27
Semester	VI
PaperType	SkillEnhancementcourse (VSC)
Credits	02(Practical based)
TotalHours	60 Hours
FormativeAssessmentMarks	20Marks
SummativeAssessmentMarks	30Marks
Total Marks	50Marks

CourseObjectives

1. To train students in the preparation of Dyes.
2. To develop Industrial Knowledge abou Industrial Dyes & Dyes Intermediates
3. To introduce Raw material Requirement
4. To enable students to use online platforms for literature survey and scientific research.

CourseOutcomes (COs)

Aftercompletingthiscourse, studentswillbeableto:

CO No.	Course Outcome	Bloom'sLevel	PO Mapped
CO1	To study & understand preparation of Dye.	Remember/ Understand	PO1,PO2
CO2	To study Industrial requirements raw material of Dyes & Dyes Intermediates.	Apply/Analyze	PO3,PO4
CO3	Analyse Industrial dyes by various methods.	Apply	PO3,PO6

DetailedSyllabus: Dye & Dye Intermedites,SICVSC-1351

Sr. No	PracticalExercises	Hrs. Requiredto cover the contents
1.	Preparation of Methylene Blue	4
2.	Preparation of Phenyazo- β-napthol	4
3.	Preparation of Magneson II	4
4.	Preparation of Chrysoidine	4
5.	Preparation of Indigo carmine	4
6.	Preparation of Amarnath	4
7.	Preparation of Crystal Voilet	4
8.	Preparation of Eosine	4
9.	Preparation of Malachite Green	4
10.	Preparation of R-Acid	4
11.	Preparation of B-Napthol	4
12.	Preparation of Resorcinol	4
13.	Preparation of Orange II Dye	4
14.	Preparation of J-acid	4
15.	Industrial Visit	4
	Total	**60**

Reference Books:

1. Practical Mannual for UGC sponsored vocational subject in Industrial Chemistry-Polymers, 1997.

2. A Text book on Experiments and Calculations in Engineering Chemistry –SSDara, S.Chand & Co.ltd.Publication 2007.

3.Industrial Chemistry (Experimental Study Book-NEP 2020)-Dr.P.S.Mane, MEWADEV GRANTH AVADEMY, 2025

4.Advanced Practical Chemistry R. Mukhopaddhyay ,P.Chatargee

Swami Ramanand Teerth Marathwada University,Nanded
Faculty of Science & Technology

Name of the Program	B.Sc.(Industrial Chemistry),ThirdYear
Title of the Paper/Course	On-JobTraining(OJT) inChemistry,SICOJT-1351
Year of Implementation	AcademicYear2026–2027
Semester	VI
Paper Type	Skill-Based/Internship/OJT
Credits	4
Total Hours	120 Hours(Minimum2-3Weeks)
Formative Assessment Marks	40Marks
Summative Assessment Marks	60Marks
Total Marks	100Marks

CourseDescription:

The **On-Job Training (OJT)** programme provides students with **hands-on industrial experience** in chemical industries such as pharmaceuticals, petrochemicals, polymers, dyes, fertilizers, food processing, and environmentalsectors. Students will gain exposure to **industrial operations, process control, quality assurance, safety practices, and analytical techniques**, enabling them to bridge the gap between academic knowledge and industrial applications.

CourseObjectives:

- Toprovidereal-timeexposureto **industrialchemicalprocessesandplant operations**.
- To develop skills in **handling instruments, quality control techniques, and industrial analysis**.
- To understand**industrial safety,environmental regulations,and wastemanagement practices**.
- To enhance **professional skills, teamwork, and problem-solving abilities** in industrial environments.

CourseOutcomes(COs):

CO No.	**Uponcompletionofthiscourse,studentswillbeableto:**	**Bloom'sLevel**	**PO Mapped**
CO1	Describe industrial processes,plantlayout,and operational workflow.	Remember/ Understand	PO1, PO2
CO2	Apply analytical and quality control techniques in industrial settings.	Apply	PO3
CO3	Analyze process parameters,efficiency,and productquality.	Analyze	PO4
CO4	Evaluate industrial safety practices and environmental Management systems.	Evaluate	PO5
CO5	Demonstrate professional skills including teamwork, communication,and documentation.	Apply/Create	PO6
CO6	Prepare and present a comprehensive industrial training report.	Create	PO7

DetailedSyllabus/TrainingComponents

Unit No.	UnitTitle	Topics/Activities	Hours
I	Industrial Orientation	Introduction to industry,plan tayout,rawmaterials, Product line, safetyrules, and standard operating procedures (SOPs).	40
II	Process & Production Training	Study of manufacturing processes, reaction conditions,processflowdiagrams,andproduction techniques.	50
III	Quality Control & Analytical Techniques	Exposure to laboratory instruments, sampling Techniques, testing procedures, and qualityassurance practices.	40
IV	Environmental & Safety Practices	Wastemanagement,effluenttreatment,pollution control,industrialsafetymeasures,andregulatory compliance.	25
V	Project Work & Report Preparation	Data collection, analysis, industrial problem Identification, reportwriting, presentation, andviva.	25

Total Hours: 180

RecommendedTextbooks:

1. Austin,G.T.,*Shreve'sChemicalProcessIndustries*,McGrawHill.
2. Rao,G. N.,*OutlinesofChemicalTechnology*,East-WestPress.
3. Sawyer,C. N.,*ChemistryforEnvironmentalEngineering*, McGraw Hill.

E-Resources/ MOOCs:

1. NPTEL–IndustrialChemistry/ChemicalEngineering
2. SWAYAM–EnvironmentalChemistry/AnalyticalTechniques