KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

COIMBATORE – 641 029

PROGRAMME NAME: Certificate Programme in Chemical Analysis and Laboratory Techniques

Curriculum and Scheme of Examination under CBCS

(Applicable to students admitted during the academic year 2024-2025)

Subject Code	Title of the paper	Instruction hours/cycle	Exam Marks			Duration of Exam (Hrs)	Credits
			CIA	ESE	Total		
24CCL101	Core Paper 1- Basic Laboratory Concepts	2	25	75	100	3	2
24CCL1CL	Core Practical 1 - Essential Chemical Laboratory Techniques	3	25	75	100	3	2
24CCL1CM	Core Practical 2 – Application Oriented Practical	3	25	75	100	3	2
	Total	8	-	-	300	-	6

Note :

CBCS – Choice Based Credit System,

CIA – Continuous Internal Assessment

ESE – End of Semester Examinations

Tally Table

Subject	No. of Subjects	Total Marks	Credits
Core – Theory	1	100	2
Core – Practical	2	200	4
Grand Total		**300**	**6**

25 % CIA is applicable to all subjects

Components of Continuous Internal Assessment

Components		Marks	Total
Theory			
CIA I	75	(75+75 = 150/10) 15	25
CIA II	75		
Assignment/Seminar		5	
Attendance		5	
Practical			
CIA Practical		25	40
Observation Notebook		10	
Attendance		5	

BLOOM'S TAXONOMY BASED ASSESSMENT PATTERN

K1-Remembering; **K2**-Understanding; **K3**-Applying; **K4**-Analyzing; **K5**-Evaluating

1. **Theory Examination**

   CIA I & II and ESE: 75 Marks

Knowledge Level	Section	Marks	Description	Total
K1 – K2 Q1 to 10	A (Answer all)	10 x 1 = 10	MCQ	75
K2 – K4 Q11 to 15	B (Either or pattern)	5 x 5 = 25	Short Answers	
K2 – K4 Q16 to 20	C (Either or pattern)	5 x 8 = 40	Descriptive / Detailed	

2. **Practical Examination:**

Knowledge Level	Section	Marks	Total
K3	Experiments	50	60
K4	Record Work	10	
K5			

24CCL101

Certificate Programme in Chemical Analysis and Laboratory Techniques			
Course Code: 24CCL101	**Core Paper 1 – Basic Laboratory Concepts**		
Year	Hours / Cycle	Total Hours	Credits
2024-2025	2	30	2

Course Objectives

1. To motivate the students to comprehend a knowledge on some basic laboratory ideas and concepts.
2. To impart understanding in laboratory hygiene and safety.
3. To enable the students to learn different separation techniques.

Course Outcomes (CO)

K1 to K5	**CO1**	Recall the concepts of laboratory hygiene and safety
	CO2	Review the working of Weighing and Analytical balance
	CO3	Describe the cleaning methods of laboratory glassware
	CO4	Enumerate the fundamentals of titrations and indicators
	CO5	Appraise various separation techniques for separation of compounds

Syllabus

Unit I: Laboratory Hygiene and safety (6 hours)

Storage and Handling of Chemicals, Carcinogenic chemicals, Handling of ethers, Toxic and Poisonous chemicals, Waste disposal, General precautions for avoiding accidents, Poisoning-rules to avoid poisoning, treatment for specific poisons, Laboratory safety measures.

Unit II: Weighing and Analytical balance (6 hours)

Double pan balance – care and use, weighing process, calibration of weights, errors in weighing, requirements of a good balance, Single pan balance – weighing in single pan balance, rules for use, Electronic balance – weighing bottles.

Unit III: Laboratory glassware **(6 hours)**

Cleaning methods and cleansing agents – cleaning and maintenance of burette, calibration of pipette, calibration of burette, calibration of volumetric flask.

Unit IV: Titrations **(6 hours)**

Standardization, experimental requirements for volumetric analysis, concentration units, Types of titrations – Acid-base titrations, redox titrations, precipitation titrations, Types of indicators – indicators for acid-base titrations, self-indicators, external indicators.

Unit V: Separation techniques **(6 hours)**

Precipitation, Solvent extraction, Chromatography – types, principles and applications – Column chromatography, Paper Chromatography, Thin Layer Chromatography.

Teaching methodology

Smart ClassRoom/Powerpoint presentation/Seminar/Quiz/Discussion/Flipped Class

Text book:

1. R.Gopalan, P.S.Subramanian, K. Rengarajan, Elements of Analytical Chemistry, Sultan Chand & Sons, Third Edition, 2003.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	S	H	S
CO2	S	S	S	M	H
CO3	S	H	M	S	S
CO4	S	S	S	S	S
CO5	S	H	M	H	M

24CCL1CL

Certificate Programme in Chemical Analysis and Laboratory Techniques			
Course Code: 24CCL1CL	**Core Practical 1 – Essential Chemical Laboratory Techniques**		
Year 2024-2025	Hours / Cycle 3	Total Hours 45	Credits 2

Course Objectives

1. To make the students aware about preparation of standard solutions.
2. To allow the students to know and practice the techniques of performing titrations.

Course Outcomes (CO)

K1 to K5	**CO1**	Describe systematic procedures for preparation of standard solutions, indicators and some reagents
	CO2	Understand the concept of acid-base titrations and perform them effectively
	CO3	Determine the boiling points and melting points of some important organic compounds
	CO4	Prepare buffer solutions and determining their pH values
	CO5	Prepare and evaluate the crude and recrystallised form of Aspirin and Methyl Orange

Syllabus

I. Preparation of standard solutions, indicators and reagents

II. Acidimetry – Alkalimetry

1. Estimation of Na_2CO_3
2. Estimation of HCl

III. Determination of boiling point

IV. Determination of melting point

V. Preparation of buffer solutions and determination of their pH values

VI. Preparation of drug – Aspirin

VII. Preparation of dye – Methyl Orange

Teaching Methods

Demonstration and hands-on practicals

Reference books:

1. N.S. Gnanaprakasam and G. Ramamurthy, Organic Chemistry Laboratory Manual, Anand Book Depot, Chennai, **2006**.

2. V. Venkateswaran, R. Veeraswamy and A.R. Kulandaivelu, Principles of Practical Chemistry, Sultan Chand & Sons, 2nd Edition, **2012**.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	S	H	S	S	M
CO2	S	M	H	S	H
CO3	M	S	H	H	S
CO4	S	H	H	M	H
CO5	S	M	S	M	H

S-Strong H-High M-Medium L-Low

24CCL1CM

Certificate Programme in Chemical Analysis and Laboratory Techniques			
Course Code: 24CCL1CM	**Core Practical 2 – Application Oriented Practical**		
Year	Hours / Cycle	Total Hours	Credits
2024-2025	3	45	2

Course Objectives

1. To make the students determine pH and conductance of solutions.
2. To inculcate the knowledge of isolation techniques.
3. To train the students prepare liquid soap and phenyl, thereby improving their entrepreneur skills.

Course Outcomes (CO)

K1 to K5	**CO1**	Estimate hardness of various water samples
	CO2	Determine the conductance of solutions
	CO3	Isolate citric acid from lemon
	CO4	Extract lactose from milk
	CO5	Prepare liquid soap and phenyl using appropriate starting materials

Syllabus

I. Estimation of hardness of water

II. Determination of Biological Oxygen Demand (BOD)

III. Determination of Dissolved Oxygen (DO)

IV. Isolation of citric acid from lemon

V. Isolation of lactose from milk

VI. Preparation of liquid soap

VII. Preparation of phenyl

Teaching Methods

Demonstration and hands-on practicals

Reference books:

1. N.S. Gnanaprakasam and G. Ramamurthy, Organic Chemistry Laboratory Manual, Anand Book Depot, Chennai, **2006**.

2. V. Venkateswaran, R. Veeraswamy and A.R. Kulandaivelu, Principles of Practical Chemistry, Sultan Chand & Sons, 2nd Edition, **2012**.

Mapping

PSO / CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	S	H	S	M
CO2	H	H	M	S	H
CO3	H	S	H	H	M
CO4	S	H	H	S	M
CO5	S	M	M	H	H

S – Strong **H –** High **M –** Medium **L –** Low