Maharashtra State Board of Technical Education, Mumbai

K-2

LABORATORY PLAN (LP)

Academic Year: 2025-26

Date: 13/12/2025

Institute Name & Code: K. K. Wagh Polytechnic, Nashik-3 (0078) Class: FYCH

Program and Code: Chemical Engineering (CH) Course Index: CO404

Course Name: Fundamentals of Chemical Engineering & Material Course Code &. Abbr:312341(FCEM)

Total Hrs: 45 Semester: 2nd Scheme: K Name of Faculty: Dr.P.S.Bhandari

INDUSTRY EXPECTED OUTCOME

Chemical engineering student will be conversant with terminologies used and duties of chemical Engineer.

- **COURSE LEVEL LEARNING OUTCOMES (COS)**

CO204.1: Enumerate the role & responsibility of chemical engineer. .
CO204.2: Use different safety norms, symbols for performing various safe operations/processes in given Chemical industry Apply law of conservation of mass and energy to the flowing fluids.
CO204.3: Prepare the solution of given molarity/molality/normality for chemical reaction
CO204.4: Select the relevant unit operations and unit processes for given chemical industry.
CO204.5: Select suitable material of construction for relevant chemical process.

- **Teaching and Examination Scheme:**

Course Code	Course Title	Abbr.	Course Category	Learning Scheme					Credits	Paper Duration(h)	Assessment Scheme										
				Actual Contact Hrs/Week			SLH	NLH			Theory				Based on LL & TSL Practical				Based on SL		Total Marks
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
											Max	Max	Max	Min	Max	Min	Max	Min	Max	min	
312341	Fundamental chemical engineering &materials	FCEM	DSC	3	-	4	1	8	4	03	30	70	100	40	50	20	25@	10	25	**10**	200

Abbreviations: CL- Class Room Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, *# On Line Examination, @$ Internal Online Examination

- **Laboratory Learning Outcome (LLO)**

LLO No.	Title of LLO
LLO 1.1	1.1 Enlist different types chemicals used in laboratory. 1.2 Describe typical technical specifications and grades of chemicals used.
LLO 2.1	2.1 Identify hazard by referring given GHS symbol.
LLO 3.1	3.1 Identify given class of fire. 3.2 Select appropriate fire extinguisher for given situation
LLO 4.1	4.1 Select appropriate Personal Protective equipment
LLO 5.1	5.1 Describe the concept of molarity to estimate the quantities of solute required. 5.2 Prepare the solution of required molarity by following standard procedure. 5.3 Calculate the molarity of given solution by following standardization procedure.

LLO No.	Title of LLO
LLO 6.1	6.1 Explain the concept of normality to estimate the quantities of solute required. 6.2 Prepare solution of given normality by following standard procedure. 6.3 Calculate normality of solution by following standardization procedure.
LLO 7.1	7.1 Explain the concept of molality to estimate the quantities of solute and solvent required. 7.2 Prepare solution of given molality by following standard procedure. 7.3 Calculate molality of solution by following standardization procedure.
LLO 8.1	8.1 Explain the concept of pH. 8.2 Demonstrate the process of pH measurement using pH meter. 8.3 Calculate the pH by adjusting acidity or alkalinity of solution
LLO 9.1	9.1 Measure concentration of given salt solution. 9.2 Use conductivity meter for measuring electrical conductivity of a solution.
LLO 10.1	10.1 Explain the concept of density/specific gravity. 10.2 Measure density/specific gravity of given solution by using specific gravity bottle/hydrometer
LLO 11.1	11.1 Explain the concept of DBT and WBT. 11.2 Describe construction and working of sling psychrometer. 11.3 Use sling psychrometer for measuring DBT and WBT
LLO 12.1	12.1 Explain the concept of size separation by using screening. 12.2 Use screening operation for separating given sample as per particle size range
LLO 13.1	13.1 Explain the concept of saturation solubility. 13.2 Prepare saturated solution of given solute and determine saturation solubility
LLO 14.1	14.1 Explain the concept of leaching operation. 14.2 Demonstrate the leaching operation.
LLO 15.1	15.1 Explain the concept of corrosion. 15.2 Measure the rate of corrosion in different environment
LLO 16.1	16.1 Explain the effect of medium on rate of corrosion. 16.2 Describe the concept of corrosion resistance of the material.

- **COs, Practical Laboratory Learning Outcome (LLOs) and Mapping:**

PR. No	Relevant COs	Practical Laboratory Learning Outcome (LLO)	Name of Experiments/Assignment/ Sheet/ Job/ Project Activity	Planned Dates		Actual Date of conduction	Remark/ Assessment Date with Staff sign
				From	To		
1	CO1	LLO 1.1 LLO 1.2	*Prepare a list of chemical available in the chemical lab consisting of details like manufacture, Grade of chemical [LR/AR /HPLC] % purity, Specific gravity, CAS no.snd Chemical formula.	18/12/2025 19/12/2025 20/12/2025	25/12/2025 26/12/2025 27/12/2025		
2	CO1	LLO 2.1 LLO 2.2	* Categorize hazard for given chemicals using the GHS symbols.	25/12/2025 26/12/2025 27/12/2025	01/01/2026 02/01/2026 03/01/2026		

PR. No	Relevant COs	Practical Laboratory Learning Outcome (LLO)	Name of Experiments/Assignment/ Sheet/ Job/ Project Activity	Planned Dates		Actual Date of conduction	Remark/ Assessment Date with Staff sign
				From	To		
3	CO2	LLO 3.1 LLO 3.2	* Demonstrate the use of fire extinguishers available in the laboratory.	01/01/2026	08/01/2026		
				02/01/2026	09/01/2026		
				03/01/2026	10/01/2026		
4	CO2	LLO 4.1 LLO 4.2 .	*.Demonstrate the use of personal protective equipment's	08/01/2026	15/01/2026		
				09/01/2026	16/01/2026		
				10/01/2026	17/01/2026		
5	CO2	LLO 5.1 LLO 5.2	* Prepare and standardize a solution of given molarity	15/01/2026	22/01/2026		
				16/01/2026	23/01/2026		
				17/01/2026	24/01/2026		
6	CO3	LLO 7.1 LLO 7.2	* Prepare and standardize a solution of given normality	22/01/2026	29/01/2026		
				23/01/2026	30/01/2026		
				24/01/2026	31/01/2026		
7	CO4	LLO 10.1 LLO 106.2	*Prepare solution of given pH.	29/01/2026	05/02/2026		
				30/01/2026	06/02/2026		
				31/01/2026	07/02/2026		
8	CO4	LLO 11.1 LLO 11.2	* Calculate the density of various concentration to measure electrical	05/02/2026	12/02/2026		
				06/02/2026	13/02/2026		
				07/02/2026	14/02/2026		
9	CO5	LLO 13.1 LLO 13.2	* Measure DBT and WBT using a sling psychrometer to study the effect of ambient condition	12/02/2026	19/02/2026		
				13/02/2026	20/02/2026		
				14/02/2026	21/02/2026		
10	CO5	LLO 15.1 LLO 15.2	* Use given salt to prepare to prepare saturated solution	19/02/2026	26/02/2026		
				20/02/2026	27/02/2026		
				21/02/2026	28/02/2026		
11	CO5	LLO 14.1 LLO 14.2	* Calculate % recovery of dye from beet root or other substrate by leaching operation	26/02/2026	05/03/2026		
				27/02/2026	06/03/2026		
				28/02/2026	07/03/2026		
12	CO5	LLO 16.1 LLO 16.2	* Calculate the rate of corrosion in Acidic/Alkaline/Saline medium	05/03/2026	12/03/2026		
				06/03/2026	13/03/2026		
				07/03/2026	14/03/2026		

- **ASSESSMENT METHODOLOGIES/TOOLS**

A. Formative assessment (Assessment for Learning) (FA-TH)

- Continuous assessment based on process and product related performance indicators. Each practical will be assessed considering
  - 60% weightage is to process
  - 40% weightage to product

B. Summative Assessment (Assessment of Learning) (SA-TH)

- Continuous Assessment based on Process and Product related performance indicators. Each practical will be assessed considering
  - 60% weightage to Process
  - 40% weightage to Product

• Laboratory Equipment / Instruments / Tools / Software required

Sr. No.	Equipment Name with Broad Specifications	Relevant LLO Number
1	Respiratory and Non-respiratory Personal Protective Equipment as per IS standards	1,2
2	Public Address system	15
3	Portable Fire Extinguishers (CO2, Foam, Dry powder, clean extinguishing agent) as per IS standards.	3
4	Fire hydrant system	4

References:

• Suggested Learning Materials / Books

Sr. No.	Author	Title of Book	Publication
1	Dr. K. U. Mistry	Fundamentals of Industrial Safety and Health	Siddhant Prakashan,Ahmedabad, Gujrat
2	Crowl, Daniel A, Louvar, Joseph F.	Chemical Process Safety	Prentice Hall, NJ, USA, 2002,ISBN 0-13-018176-5
3	Bureau of Indian Standards	IS 14489: 1998	Government of India.
4	Bureau of Indian Standards	IS 17889: 2022	Government of India.
5	Bureau of Indian Standards	IS 17893:2023	Government of India.
6	Department of Environment, Forest and wildlife.	The Manufacture, Storage, and Import of Hazardous Chemical Rules, 1989	Government of India.

• Learning Websites & Portal

Sr. No	Link / Portal	Description
1	https://onlinecourses.swayam2.ac.in/nou23_ge81/preview	Fire prevention and protection
2	https://onlinecourses.nptel.ac.in/noc20_mg43/preview	Functioning in safer way
3	https://archive.nptel.ac.in/courses/103/106/103106071/	Fire and Explosion
4	https://onlinecourses.nptel.ac.in/noc22_ch44/preview	General chemical safety measures
5	https://safetyculture.com/topics/ppe-safety/	Personal Protective Equipment(PPE)

Dr. P.S.Bhandari
(Name & signature of staff)

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(Name & signature of HOD)