Maharashtra State Board of Technical Education, Mumbai

K-2

LABORATORY PLAN (LP)

Academic Year: 2025-26

Date: 08/12/2025

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

Program and Code: Chemical Engineering (CH) Course Index: CO306

Course Name: CHEMICAL ENGINEERING DRAWING & DESIGN Course Code &. Abbr.: 316302 (CEDD)

Total Hrs: 30 Semester: 6th Scheme: K Name of Faculty: Dr. S S Rikame

- **INDUSTRY EXPECTED OUTCOME**

The aim of this course is to help the students to attain the following industry identified outcome through various teaching learning experiences: Apply theoretical knowledge and practical skills to create accurate, detailed, and standardized engineering drawings of chemical equipment and processes, including process flow diagrams, P&ID, equipment layout and equipment designs.

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

- CO603.1 - Draw different shapes using CAD software by drawing, editing and formatting.
- CO603.2 - Draw different flanges, support for pipe and vessel in chemical industries.
- CO603.3 - Draw heat exchanger, reactors and their assembly used in chemical industries.
- CO603.4 - Draw various flow diagrams for different processes by using symbols and specification sheet in chemical industries.
- CO603.5 - Describe the design procedure of chemical equipment and design of storage tank.

Teaching and Examination Scheme:

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Paper Duration	Assessment Scheme										Total Marks
				Actual Contact Hrs/Week			SLH	NLH			Theory				Based on LL & TSL Practical				Based on SL		
											FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
				CL	TL	LL					Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
316302	CHEMICAL ENGINEERING DRAWING & DESIGN	CEDD	DEC	4	-	**4**	-	**8**	**4**	04	30	70	100	40	25	10	--	--	--	--	**125**

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	LLO 1.1 Draw basic shapes using CAD software by selecting the appropriate object from the draw menu or draw toolbar.
LLO 2.1	LLO 2.1 Draw an arc by specifying three points using CAD software, selecting the appropriate object from the draw menu or draw toolbar.
LLO 3.1	LLO 3.1 Draw flowsheet symbols using CAD software.
LLO 4.1	LLO 4.1 Sketch and explain the accurate schematic view of various flanges.
LLO 5.1	LLO 5.1 Sketch and describe the accurate drawings of various pipe support.
LLO 6.2	LLO 6.1 Sketch and explain accurate drawings of various vessels support.
LLO 7.1	LLO 7.1 Sketch and describe the accurate drawings of various vessels support.

LLO 8.2	LLO 8.1 Sketch and describe the ability to create accurate drawings of heat exchanger.
LLO 9.1	LLO 9.1 Sketch the accurate drawings of heat exchanger assembly.
LLO 10.1	LLO 10.1 Sketch and explain accurate drawings of reactors and its assembly.
LLO 11.1	LLO 11.1 Apply industry-standard symbols and conventions to represent various unit operations in process flow diagrams and instrumentation diagram.
LLO 12.1	LLO 12.1 Apply engineering principles and industry standards in the preparation of specification sheets for heat exchangers and batch reactors
LLO 13.1	LLO 13.1 Draw and describe block and flow diagrams of a given manufacturing process using appropriate symbols.
LLO 14.1	LLO 14.1 Draw and describe accurate process and instrumentation diagrams, utility line diagram of a given manufacturing process.
LLO 15.1	LLO 15.1 Draw and describe accurate equipment layout and tank farm layout of a given manufacturing process.
LLO 16.1	LLO 16.1 Apply industry standards and best practices in the design and analysis of storage tanks.

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

PR. No	Relevant COs	Practical - Laboratory Learning Outcome (LLO)	Practical Titles	Planned Dates		Actual Date of conducti on	Remark/ Assess-ment Date with Staff sign
				From	To		
1	CO1	LLO1.1	Draw a line, square, rectangle, hexagon and circle using CAD software by choosing an object either from the draw menu or draw tool bar.	A-20/12/25 B-18/12/25	A-20/12/25 B-18/12/25		
2	CO1	LLO2.1	* Draw an arc by specifying three point using CAD software by choosing an object either from the draw menu or draw tool bar.	A-27/12/25 B-25/12/25	A-27/12/25 B-25/12/25		
3	CO1	LLO3.1	Draw flowsheet symbol in CAD software for packed column, heat exchanger, agitator and centrifuge.	A-03/01/26 B-01/01/26	A-03/01/26 B-01/01/26		
4	CO2	LLO4.1	Draw schematic view of slip on flanges, Welded neck flanges, screwed flanges, blind flanges on drawing sheet.	A-10/01/26 B-08/01/26	A-10/01/26 B-08/01/26		
5	CO2	LLO5.1	* Draw Pipe Support: Single rod hanger, double rod hanger, angle iron hanger, structural bracket and hanger, roller support, yard piping support on drawing sheet.	A-17/01/26 B-15/01/26	A-17/01/26 B-15/01/26		
6	CO2	LLO6.1	* Draw vessels support: Vertical vessel supports, Bracket or lug support, Leg support, Skirt (Angular and Straight) support on drawing sheet.	A-24/01/26 B-22/01/26	A-24/01/26 B-22/01/26		
7	CO2	LLO7.1	Draw vessels support: Horizontal vessel supports,	A-31/01/26 B-29/01/26	A-31/01/26 B-29/01/26		

PR. No	Relevant COs	Practical - Laboratory Learning Outcome	Practical Titles	Planned Dates		Actual Date of conducti on	Remark/ Assess-ment Date with Staff sign
			Saddle (Plate and Ring type) support, Wear plate support.				
8	CO3	LLO8.1	* Draw shell and tube heat exchanger, U-tube heat exchanger and Kettle type reboiler on drawing sheet.	A-07/02/26 B-05/02/26	A-07/02/26 B-05/02/26		
9	CO3	LLO9.1	Draw heat exchanger assembly like tube sheet-Triangular and square pitch, Method of fixing tube sheet, segmental baffle and tie rod, shell and tube side passes.	A-14/02/26 B-12/02/26	A-14/02/26 B-12/02/26		
10	CO3	LLO10.1	* Draw batch reactor, jacketed batch reactor and assembly of process reactor like different types of nozzles, jackets, coils, agitators, types of heads/covers on drawing sheet.	A-21/02/26 B-19/02/26	A-21/02/26 B-19/02/26		
11	CO4	LLO11.1	* Draw symbols for unit operation equipment's, instrumentation as per IS 3232 on drawing sheet.	A-28/02/26 B-26/02/26	A-28/02/26 B-26/02/26		
12	CO4	LLO12.1	* Draw specification sheet for heat exchanger and batch reactor on drawing sheet.	A-07/03/26 B-05/03/26	A-07/03/26 B-05/03/26		
13	CO4	LLO13.1	* Draw the block diagram, process flow diagram for given manufacturing processes (any two).	A-14/03/26 B-12/03/26	A-14/03/26 B-12/03/26		
14	CO4	LLO14.1	* Draw, process and instrumentation diagram, utility line diagram of manufacturing processes considered in practical no. 13.	A-21/03/26 B-19/03/26	A-21/03/26 B-19/03/26		
15	CO4	LLO15.1	* Draw equipment layout and tank farm layout of manufacturing processes considered in practical no. 13.	A-28/03/26 B-26/03/26	A-28/03/26 B-26/03/26		
16	CO5	LLO16.1	* Visit the nearby industry to observe the storage tank and calculate the thickness of storage tank for given fluid and compare the actual tank with the designed tank.	A-04/04/26 B-02/04/26	A-04/04/26 B-02/04/26		

- **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	Visit to nearby industry .	LLO16.1
2	Drawing sheet, Drawing board, Drawing kit	All
3	CAD Software	LLO1.1, 2.1, 3.1

• References:

• Suggested Learning Materials / Books:

Sr. No.	Author	Title of Book	Publication
1	A .P. Gautam, Pradeep Jain	Engineering Autocad	Khanna Publishers ISBN-13: 978-9381068946
2	Richard Turton, Richard C. Bailic, Wallace B. Whiting, Joseph A. Shaeiwitz, Debangsu Bhattacharyya	Analysis, Synthesis and Design of Chemical Processes,	Published Jun 22, 2012 by Prentice Hall. Part of the Prentice Hall International Series in the Physical and Chemical Engineering Sciences series. ISBN-13: 978-0-13-261812-0
3	Richard Turton, Joseph A. Shaeiwitz	Chemical Process Equipment Design	Published Feb 1, 2017 by Prentice Hall. ISBN-13: 978-0-13-380447-8
4	D.G. Austin	Chemical Engineering Drawing Symbols	George Godwin Ltd (April 1979) ISBN-13: 978-0711433182

• Learning Websites & Portal

Sr. No.	Link / Portal	Description
1	https://www.pveng.com/wp-content/uploads/2016/06/HeatExchanger_Drawing.pdf	Learning material
2	https://www.essentialchemicalindustry.org/processes/chemical	Learning material
3	https://www.autodesk.com/education/free-software/autocad.	Learning material
4	https://www.autodesk.com/education/edu-software/overview	Learning material
5	https://www.chemengstudent.com/complete-guide-to-designing-a-heat-exchanger/?v=13b5bfe96f3e	Learning material

Dr. S. S. Rikame
(Name & signature of staff)

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