Maharashtra State Board of Technical Education, Mumbai

K-2

LABORATORY PLAN (LP)

Academic Year: 2026-27

Date: 01/07/2026

Institute Name & Code: K. K. Wagh Polytechnic, Nashik-3 (0078) Class: SYCH
Program and Code: Chemical Engineering (CH) Course Index: CO306
Course Name: Process Instrumentation & Control Course Code &. Abbr.: 313341(PIC)
Total Hrs: 30 Semester: III[rd] Scheme: K Name of Faculty: Dr. S S Rikame

- **INDUSTRY EXPECTED OUTCOME**

The course should be taught and implemented with the aim to develop required skills in students so that they are able to acquire following industry outcome: Apply appropriate instrumentation and control for given chemical process industries.• Identify various instrumentation procedures for given chemical process equipment.

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

- CO306.1 - Identify applicable instruments for measuring process variables in the chemical industry.
- CO306.2 - Measure temperature using various temperature measuring instruments in the chemical industry.
- CO306.3 - Measure pressure using various pressure measuring instruments in the chemical industry.
- CO306.4 - Measure the flow and level using various flow and level measuring instruments in the chemical industry.
- CO306.5 - Integrate a control system with different controllers in the chemical industry.

- **Teaching and Examination Scheme:**

Course Code	Course Title	Abbr	Course Category/s	Learning Scheme					Credits	Paper Duration	Assessment Scheme										
				Actual Contact Hrs/Week			SLH	NLH			Theory				Based on LL & TSL Practical				Based on SL		Total Marks
											FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
				CL	TL	LL					Max	Max	Max	Min	Max	Min	Max	Min	Max	Min	
313341	Process Instrumentation & Control	PIC	SEC	3	-	**4**	1	**8**	**4**	03	30	70	100	40	25	10	25#	10	25	10	175

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	Apply calibration process to the temperature measuring instrument.
LLO 2.1	Measure temperature by using different thermometers.
LLO 3.1	Use pyrometer for measurement of high temperature
LLO 4.1	Apply calibration process to the pressure measuring instrument
LLO 5.1	Use LVDT for pressure measurement.
LLO 6.2	Use strain gauge for pressure measurement.
LLO 7.1	Utilize Mc Leod gauge for Vacuum measurement.
LLO 8.2	Apply electromagnetic flow meter for conductive fluid flow measurement.
LLO 9.1	Use turbine flow meter for fluid flow measurement.
LLO 10.1	Use air purge method for the measurement of liquid level
LLO 11.1	Use capacitance probe method for the measurement of liquid level.
LLO 12.1	Control the given process variable by using ON-OFF Controller.

LLO 13.1	Control the given process variable by using PD Controller.
LLO 14.1	Control the given process variable by using PI Controller
LLO 15.1	Control the given process variable by using PID Controller
LLO 16.1	Operate control valve to regulate the given process.

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

PR. No	Relevant COs	Practical - Laboratory Learning Outcome (LLO)	Practical Titles	Planned Dates		Actual Date of conduction	Remark/ Assess-ment Date with Staff sign
				From	To		
1	CO1, CO2	LLO 1.1	*Calibrate mercury glass thermometer	A-03/07/26	A-03/07/26		
				B-06/07/26	B-06/07/26		
				C-02/07/26	C-02/07/26		
2	CO2	LLO2.1	*Measure temperature using Resistance Temperature Detector or Thermistor or Thermocouple	A-10/07/26	A-10/07/26		
				B-13/07/26	B-13/07/26		
				C-09/07/26	C-09/07/26		
3	CO3	LLO 4.1	*Calibrate pressure gauge by using dead weight tester.	A-17/07/26	A-17/07/26		
				B-20/07/26	B-20/07/26		
				C-16/07/26	C-16/07/26		
4	CO2	LLO 3.1	Measure high temperature by using Pyrometer.	A-24/07/26	A-24/07/26		
				B-27/07/26	B-27/07/26		
				C-23/07/26	C-23/07/26		
5	CO3	LLO 6.1	*Measure pressure by using strain gauge	A-31/07/26	A-31/07/26		
				B-03/08/26	B-03/08/26		
				C-30/07/26	C-30/07/26		
6	CO3	LLO 5.1	Measure pressure by using Linear Variable Differential Transducer (LVDT).	A-07/08/26	A-07/08/26		
				B-10/08/26	B-10/08/26		
				C-06/08/26	C-06/08/26		
7	CO4	LLO 8.1	*Measure the flow rate of fluid using Electromagnetic flow meter.	A-14/08/26	A-14/08/26		
				B-17/08/26	B-17/08/26		
				C-13/08/26	C-13/08/26		
8	CO3	LLO 7.1	*Measure the level of liquid by using Bubbler Method	A-21/08/26	A-21/08/26		
				B-24/08/26	B-24/08/26		
				C-20/08/26	C-20/08/26		
9	CO4	LLO 10.1	Measure the level of liquid by using capacitance probe method.	A-28/08/26	A-28/08/26		
				B-31/08/26	B-31/08/26		
				C-27/08/26	C-27/08/26		
10	CO4	LLO 11.1	*Use ON-OFF	A-04/09/26	A-04/09/26		

PR. No	Relevant COs	Practical - Laboratory Learning Outcome (LLO)	Practical Titles	Planned Dates		Actual Date of conduction	Remark/ Assess-ment Date with Staff sign
			Controller to measure given process variable.	A-18/09/26	A-18/09/26		
				B-21/09/26	B-21/09/26		
11	CO2CO 3CO4C O5	LLO 12.1	**Use PI controller to measure given process variable**	C-17/09/26	C-17/09/26		
				A-25/09/26	A-25/09/26		
				B-28/09/26	B-28/09/26		
12	CO5	LLO 16.1	Calculate % flow and % valve opening of control valve and draw characteristics of control valve	A-18/09/26	A-18/09/26		
				B-21/09/26	B-21/09/26		
				C-17/09/26	C-17/09/26		
13			**Practical Beyond Syllabus**	A-25/09/26	A-25/09/26		
				B-28/09/26	B-28/09/26		
				C-24/09/26	C-24/09/26		

- **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	Mercury in glass thermometer 0-degree Celsius to 200-degree Celsius	1,2
2	RTD Standard PT-100 RTD, Digital Voltmeter and ammeter, heater with regulator.	1,2
3	Thermocouple K type, Cr-Al thermocouple, heater with regulator, Digital temperature indicator	1,2
4	Thermistor-NTC disc type, Temperature range- -250C to 80 0C. Digital Voltmeter and ammeter, heater with regulator	1,2
5	Air purge system, Pipe size 1”, fluid: water and air supply.	10
6	Capacitance probe with parallel plate assembly	11
7	ON-OFF controller kit, Supply voltage 1.6V to 5.5V max, operating temperature 0 to 100oC, I/O response - high	12
8	PID Controller kit for measuring P, PI, PD, and PID	13,14,15
9	Pneumatic actuated diaphragm control valve, valve size 1”, air to open, seat and plug, SS, complete assembly.	16
10	Pyrometer- RA-Red pyrometer 20 to 450 degree Celcius with special resource of 6-14 micrometer 2) Heating source-wooden box fitted with filament lamp rated 200 V, 200 W 3) Mercury in glass thermometer 0 to 50 degree Celcius.	3

11	Dead weight tester, 0 to 40 kg/cm2 predetermined dead weight.	4
12	LVDT, Bellows type pressure transducer, inlet pressure 2Kg/cm2 maximum	5
13	Strain gauge industrial grade pressure transducer, maximum pressure 10 Kg/cm2	6
14	Mc Leod gauge- Pressure range-12 Bar, Material-Glass, Measuring Parameter-Vacuum, Vacuum range-0.01 mmHg	7
15	Electromagnetic flowmeter, size 1", fluid: water, complete assembly.	8
16	Turbine flow meter, size 1", fluid: water, complete assembly.	9

- **References:**
- **Suggested Learning Materials / Books:**

Sr. No.	Author	Title of Book	Publication
1	W. M. Morgan	Chemical Process Control: An Introduction to Theory and Practice	CBS Publishers & Distributors Pvt. Ltd, 2000 ISBN: 9788123904306
2	H. F. Payne	Industrial Instrumentation and Control	John Wiley & Sons Inc (1961) ISBN: 9780471673538
3	V.C. Malshe and Meenal Sikchi	Fundamental of Industrial Instrumentation	Antar Prakash Centre for Yoga, 2004 ISBN: 9788190329859
4	Dr. Swaraj Paul	Industrial Control and Instrumentation	John Wiley and Sons Ltd.2014 ISBN:9788126552559
5	S. K. Singh	Industrial Instrumentation & Control	ISBN: 9780070678200

- **Learning Websites & Portal**

Sr. No	Link / Portal	Description
1	https://nptel.ac.in/courses/103103037	Cascade and Ratio Controller
2	https://archive.nptel.ac.in/courses/103/105/103105064/	Pressure Measurement
3	https://archive.nptel.ac.in/courses/103/105/103105064/	Pneumatic Control System
4	https://archive.nptel.ac.in/courses/103/105/103105130/	General Principles and Representation of Instruments
5	https://archive.nptel.ac.in/courses/103/105/103105130/	Performance Characteristics of Instruments
6	https://archive.nptel.ac.in/courses/103/105/103105130/	Transducer Element
7	https://archive.nptel.ac.in/courses/103/105/103105130/	High Vacuum Measurement
8	https://archive.nptel.ac.in/courses/103/105/103105130/	Temperature Measurement
9	https://archive.nptel.ac.in/courses/103/105/103105130/	Flow Measurement
10	https://archive.nptel.ac.in/courses/103/105/103105130/	Level Measurement
11	https://archive.nptel.ac.in/courses/103/105/103105130/	Pneumatic Control Valve

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