Format K1

Maharashtra State Board of Technical Education, Mumbai

TEACHING PLAN (TP) Academic Year: **2026-27 (ODD)**

Institute Code and Name: 0078- K. K. Wagh Polytechnic, Nashik **Semester**: Third
Programme and Code: Chemical Engineering (CH) **Course Index:** 306
Course and Code: Process Instrumentation and Control (PIC)313341
Name of Faculty: Dr S. S. Rikame **CLASS: SYCH**

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 instrumetation 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-LEARNING & ASSESSMENT SCHEME

Course Code	Course Title	Abbr	Course Category	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

Total IKS Hrs for Sem.: 1 Hrs

Abbreviations: CL- Classroom 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

THEORY LEARNING OUTCOME (TLO)

TLO No.	Title of TLO
TLO 1.1	TLO 1.1 Describe the applications of Measurement and its aim..
TLO 1.2	TLO 1.2 Differentiate between direct and indirect method of measurement
TLO 1.3	TLO 1.3 Explain functional elements of an instrument with neat sketch.
TLO 1.4	TLO 1.4 Explain the causes of dead zone for the given instrument.
TLO 1.5	TLO 1.5 Identify the static and dynamic characteristic of given instrument.
TLO 2.1	TLO 2.1 List out temperature measuring scales used for temperature measurement.
TLO 2.2	TLO 2.2 Explain the construction and working of given expansion thermometer with neat sketch.
TLO 2.3	TLO 2.3 Describe the working principle of given electrical temperature sensors.
TLO 2.4	TLO 2.4 Select the thermometer to measure high temperatures
TLO 3.1	TLO 3.1 Determine pressure in different units.
TLO 3.2	TLO 3.2 Explain construction of given pressure gauge with neat sketch.
TLO 3.3	TLO 3.3 Delineate the calibration process of pressure gauge by using dead weight tester.
TLO 3.4	TLO 3.4 Describe the function of given electrical pressure transducer.
TLO 3.5	TLO 3.5 Select pressure measuring instrument for low pressure measurement.
TLO 4.1	TLO 4.1 Identify instrument to measure the flow rate of viscous fluid.
TLO 4.2	TLO 4.2 Describe with sketches the working of the given flow meters.
TLO 4.3	TLO 4.3 Explain construction of the given flow meters with neat sketch.
TLO 4.4	TLO 4.4 Identify the instrument that will measure fluid flow based on temperature differences.
TLO 4.5	TLO 4.5 Differentiate direct and indirect level measurement methods.
TLO 4.6	TLO 4.6 Explain indirect type level measurement system with neat sketch.
TLO 4.7	TLO 4.7 Select method for noncontact type level measurement.
TLO 5.3	TLO 5.1 Differentiate between SISO and MIMO.
TLO 5.2	TLO 5.2 Draw the block diagram of the given control system.
TLO 5.3	TLO 5.3 Identify controllers on the basis of control action

SUGGESTED COS - POS MATRIX FORM

Course Outcomes (COs)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO-1 Basic and Discipline Specific Knowledge	**PO-2 Problem Analysis**	**PO-3 Design/ Development of Solutions**	**PO-4 Engineering Tools**	**PO-5 Engineering Practices for Society, Sustainability and Environment**	**PO-6 Project Management**	**PO-7 Life Long Learning**	**PSO-1**	**PSO-2**	**PSO-3**
CO1	3	1	-	1	1	1	3			
CO2	2	2	2	2	2	-	2			
CO3	2	2	2	2	2	-	2			
CO4	2	2	2	2	2	-	2			
CO5	3	2	2	3	2	2	2			

Legends :- High:03, Medium:02,Low:01, No Mapping: -
*PSOs are to be formulated at institute level

Maharashtra State Board of Technical Education K-1

Teaching Plan (TP)

Academic Year: 2026-27 **Institute Code:** 0078
Program: Chemical Engineering **Course Code:** 313341
Course: Process Instrumentation and Control (PIC) **Semester:** Third (CH-2K)
Name of faculty: Dr. S. S. Rikame

Chap No. (Allotted Hrs.)	CO Mention only Number	TLO Mention only Number	Unit Name and Learning Content Title/ Details	No. of Lecture	Plan (From-To)	Actual Execution (From-To)	Teaching method/ Media	Remark
Unit - I Introduction to Instrument Measurement System								
1 (04)	**CO-1**	**TLO 1.1**	1.1 Measurement and its Aim: Definition and application.	1	01/07/2026		Blackboard, Books, media, PPT	
		TLO 1.2	1.2 Measurement methods – Direct and Indirect method.	1	02/07/2026 to 02/07/2026			
		TLO 1.3	1.3 Functional elements - Primary, Secondary, Manipulating element, Data transferring element. **MKCL Quiz 1**	1	04/07/2026 to 04/07/2026			
		TLO 1.4, TLO 1.5	1.4 Static characteristics – Definition of Calibration, Accuracy, Precision, Repeatability, Drift, Sensitivity, Dead zone, Causes of Dead Zone and Static error. 1.5 Dynamic characteristics – Speed of Response, Time lag, Dynamic	1	08/07/2026 to 08/07/2026			**1 extra**

Chap No. (Allote d Hrs.)	CO Mention only Number	TLO Mention only Number	Unit Name and Learning Content Title/ Details	No. of Lecture	Plan (From-To)	Actual Execution (From-To)	Teaching method/ Media	Remark
			Error.					
			Practice test 1 and MKCL Quiz 2*	1	09/07/2026			
Unit - II Temperature Measuring Instrument								
2(08)	**CO-2**	**TLO 2.1**	2.1 Temperature Scales- Centigrade, Kelvin, Fahrenheit, Rankine and Reaumur..	2	11/07/2026 to 15/07/2026		Blackboard, Books, media, PPT	
		TLO 2.2	2.2 Expansion thermometer: Principle, Construction, Working and Application of Spiral Bimetallic thermometer and Mercury in glass thermometer	2	16/07/2026 to 18/07/2026			
		TLO 2.3	2.3 Electrical Temperature Sensor: Principle, Construction, Working and Application of Resistance Temperature Detector, Thermocouple and Thermister. **MKCL Quiz 3**	2	22/07/2026 to 23/07/2026			
		TLO 2.4	2.4 Pyrometer: Principle, Construction, Working and Application of Optical and Radiation pyrometer. **MKCL**	2	25/07/2026 to 29/07/2026			

Chap No. (Allote d Hrs.)	CO Mention only Number	TLO Mention only Number	Unit Name and Learning Content Title/ Details	No. of Lecture	Plan (From-To)	Actual Execution (From-To)	Teaching method/ Media	Remark
			Quiz 4; Practice test 2					
Unit - III Pressure Measuring Instrument.								
3(08)	**CO-3**	**TLO 3.1**	3.1 Units of Pressure & Methods for Pressure Measurement	1	30/07/2026		Blackboard, Books, media, PPT	
		TLO 3.2	. 3.2 C-type Bourdon tube and Bellows: Principle, Construction and Application. **MKCL Quiz 5**	1	01/08/2026 to 01/08/2026			
		TLO 3.3	3.3 Force balance pressure gauge – Principle, Construction, Workings and Application of Dead Weight Tester.	2	05/8/2026 to 06/8/2026			
		TLO 3.4	3.4 Electrical Pressure Transducer – Principle, Construction, Workings and Application of LVDT and Strain gauge.	2	08/8/2026 to 12/8/2026			
		TLO 3.5	3.5 Vacuum Measurement – Principle, Construction, Workings and Application of McLeod gauge. **MKCL Quiz 6, Practice test 3**	2	13/8/2026 to 15/8/2026			

Chap No. (Allote d Hrs.)	CO Mention only Number	TLO Mention only Number	Unit Name and Learning Content Title/ Details	No. of Lecture	Plan (From-To)	Actual Execution (From-To)	Teaching method/ Media	Remark
Unit - IV Flow and Level Measuring Instrument								
4(10)	**CO-4**	**TLO 4.1**	4.1 Piston type flow meter: Principle, Construction, Working and Application.	1	19/8/2026		Blackboard, Books, media, PPT	
		TLO 4.2	4.2 Electromagnetic flow meter, Ultrasonic flow meter, Turbine flow meter: Principle, Construction, Working and Application. **MKCL Quiz 7**	2	20/8/2026 to 22/8/2026			
		TLO 4.3	4.3 Positive displacement flow meter: Rotating vane meter-Principle, Construction, Working and Application.	1	26/8/2026			
		TLO 4.4	4.4 Psychrometric Process: Humidification and dehumidification	1	27/8/2026			
		TLO 4.5	4.5 Thermal mass flow meter: Heat transfer typePrinciple, Construction, Working and Application.	2	29/8/2026 to 02/9/2026			**1 extra**
		TLO 4.6	4.6 Indirect method for level measurement: Principle, Construction,	2	03/09/2026 to 05/09/2026			

Chap No. (Allote d Hrs.)	CO Mention only Number	TLO Mention only Number	Unit Name and Learning Content Title/ Details	No. of Lecture	Plan (From-To)	Actual Execution (From-To)	Teaching method/ Media	Remark
			Working and Application of hydrostatic level measurement (pressure gauge, differential pressure and air purge)					
		TLO 4.7	4.7 Ultrasonic, Radioactive and Capacitance probe type level measurement: Principle, Construction, Working and Application. **Practice test 4 and MKCL Quiz 8**	2	09/09/2026 to 10/09/2026			
Unit - V Automated Control System								
5(20)	**CO-5**	**TLO5.1**	5.1 Types of system- single input system and multiinput system.	2	12/09/2026 to 16/09/2026		Blackboard, Books, media, PPT	
		TLO 5.2, TLO 5.3	5.2 Control system classification- open loop and closed loop. 5.3 Control action- ON-OFF, P, PI, PID (Only Pneumatic Controller) **Difference between electronics and pneumatic controller (Beyond syllabus)**	4	17/09/2026 to 24/09/2026			**1 extra**
		TLO 5.5, TLO	5.5 Distributed control system and	3	26/09/2026 to 01/10/2026			

Chap No. (Allote d Hrs.)	CO Mention only Number	TLO Mention only Number	Unit Name and Learning Content Title/ Details	No. of Lecture	Plan (From-To)	Actual Execution (From-To)	Teaching method/ Media	Remark
		5.6	Programmable logic controller-principle and block diagram 5.6 SCADA-Definition, Architecture and application in chemical industry. **MKCL Quiz 9**					
		TLO 5.4, TLO 5.7	5.4 Cascade and Ratio controller-Diagram and Working. 5.7 IoT-Definition, Characteristics of IoT, Features and Application of IoT	3	03/10/2026 to 09/10/2026			
		TLO 5.8, TLO 5.9	5.8 Types of control valve-air to open, air to close, Valve characteristics-linear, equal %, quick opening. 5.9 Valve actuator and valve positioner-Function in Control Valve. **Practice test 5 and MKCL Quiz 10**	3	10/10/2026 to 13/11/2026			**1 extra**

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

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 & PORTALS

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

Note : Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

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CC: Course file –PIC-313341