

TUTORIAL PLAN (TP)**Academic Year: 2025-26**

Date: 14/12/2025

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

Class: SYCH

Program and Code: Chemical Engineering (CH)

Course Index: CO406

Course Name: Chemical Engineering Thermodynamics.

Course Code & Abbr.: 314308 (CET)

Total Hrs: 30

Semester: 4th

Scheme: K

Name of Faculty: P M Pathak

- INDUSTRY EXPECTED OUTCOME**

Apply basic concepts, laws, and principles of thermodynamics to calculate heat and work requirements for Physical and chemical changes in various chemical engineering processes:

- COURSE LEVEL LEARNING OUTCOMES (COS)**

- CO402.1:** Use basic concepts of thermodynamics for given chemical processes
- CO402.2:** Apply first law of thermodynamics to improve the chemical process
- CO402.3:** Apply second law of thermodynamics to describe entropy of system.
- CO402.4:** Use P-V-T graphical representation of fluids for different process.
- CO402.5:** Apply concept of chemical equilibrium in chemical process.

- 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
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
													Max	Min	Max	Min	Max	Min	Max	Min	
314308	CHEMICAL ENGINEERING THERMODYNAMICS	CET	DSC	4	2	--	--	6	3	03	30	70	100	40	50	20	--	--	--	--	150

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	Calculate heat of given system
LLO 2.1	Calculate work of given system
LLO 3.1	Calculate internal energy of given system
LLO 4.1	Derive an expression for work done for given reversible process.
LLO 5.1	Apply first law of thermodynamics to calculate ΔU for given process
LLO 6.1	Apply first law of thermodynamics to calculate ΔH for given process
LLO 7.1	Explain relation between C_p , C_v and R
LLO 8.1	Calculate entropy changes for adiabatic mixing of given system
LLO 9.1	Explain concept of Entropy
LLO 9.2	Calculate entropy changes for ideal gas
LLO 10.1	Explain concept of Entropy
LLO 10.2	Calculate entropy changes for given system
LLO 11.1	Explain thermodynamic diagram
LLO 12.1	Use Vander Waals equation to calculate volume of real gas
LLO 13.1	Explain phase rule
LLO 13.2	Calculate degree of freedom for given system

LLO No.	Title of LLO
LLO 14.1	Explain equilibrium constant for gaseous mixture
LLO 15.1	Calculate effect of temperature on equilibrium constant using Van't Hoff's equation
LLO 15.2	Apply Le-Chatelier's principle to solve numerical

● 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	* Numerical based on heat (Q)	A-16/12/25	A-23/12/25		
				B-18/12/25	B-02/01/26		
				C-15/12/25	C-22/12/25		
2	CO1	LLO 2.1	* Numerical based on work (W)	A-23/01/26	A-07/01/26		
				B-02/01/26	B-09/01/26		
				C-22/12/25	C-06/01/26		
3	CO1 CO2	LLO 3.1	* Numerical based on internal energy	A-30/12/25	A-06/01/25		
				B-09/01/26	B-16/01/26		
				C-29/12/25	C-05/01/26		
4	CO1 CO2	LLO 5.1	* Numerical on ΔU using first law of thermodynamics	A-06/01/26	A-13/01/26		
				B-16/01/26	B-23/01/26		
				C-05/01/26	C-12/01/26		
5	CO1 CO2	LLO 6.1	Numerical on ΔH using first law of thermodynamics.	A-13/01/26	A-20/01/26		
				B-23/01/26	B-30/01/26		
				C-12/01/26	C-19/01/26		
6	CO2	LLO 7.1	*Derivation between C_p , C_v and R	A-20/01/26	A-03/02/26		
				B-30/01/26	B-07/02/26		
				C-19/01/26	C-02/02/26		
7	CO3	LLO 8.1 LLO 9.1	Numerical on entropy changes for adiabatic mixing *Numerical on entropy changes of for ideal gas	A-03/02/26	A-10/02/26		
				B-07/02/26	B-14/02/26		
				C-02/02/26	C-09/02/26		
8	CO3	LLO 10.1 LLO 10.2	Numerical on entropy changes for isothermal mixing	A-10/02/26	A-17/02/26		
				B-14/02/26	B-21/02/26		
				C-09/02/26	C-16/02/26		
9	CO3	LLO 11.1	* Plot the curve of P-V-T (pressure-volume-temperature), T-S (temperature-entropy), H-T (enthalpy – temperature), P-H (pressure-enthalpy) and H-S (enthalpy – entropy)	A-17/02/26	A-24/02/26		
				B-21/02/26	B-28/02/26		
				C-16/02/26	C-23/02/26		
10	CO4	LLO 12.1	Numerical on Vander Waals equation	A-24/02/26	A-01/03/26		
				B-28/02/26	B-05/03/26		
				C-23/02/26	C-30/02/26		
11	CO4	LLO 13.1	*Numerical on Gibb's phase rule	A-01/03/26	A-03/03/26		
				B-05/03/26	B-12/03/26		
				C-30/02/26	C-02/03/26		
12	CO4	LLO 14.1	* Derivation for the equilibrium constant (K_p & K_c) and (K_p & K_y)	A-03/03/26	A-10/03/26		
				B-12/03/26	B-19/03/26		
				C-02/03/26	C-09/03/26		
13	CO4	LLO 15.1	* Numerical on Van't Hoff's equation and Le-Chatelier's principle	A-10/03/26	A-17/03/26		
				B-19/03/26	B-26/03/26		
				C-09/03/26	C-16/03/26		

- **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

- **Laboratory Equipment / Instruments / Tools / Software required**

Sr. No.	Equipment Name with Broad Specifications	Relevant LLO Number
1	NA	NA

- **References:**

- **Suggested Learning Materials / Books**

Sr. No.	Author	Title of Book	Publication
1	K. V. Narayanan	A Textbook of Chemical Engineering Thermodynamics	Prentice Hall India Pvt., Limited, ISBN:9788120317321, 8120317327
2	Joseph Mauk Smith, Hendrick C. Van Ness, Michael M. Abbott, M.T. Swihart	Introduction to Chemical Engineering Thermodynamics	Mc Graw Hill, New York, 2009, ISBN 9781118843727
3	Stanley I. Sandler	Chemical and Engineering Thermodynamics	Wiley, ISBN: 9780471017745, 0471017744
4	Y. V. C. Rao	Chemical and Engineering Thermodynamics	Sangam Books, ISBN:9788173710483, 8173710481
5	P. K. Nag	Engineering Thermodynamics	Mc Graw Hill, New York, 2009, ISBN: 078-87-403-0363-6

- **Learning Websites & Portal**

Sr. No	Link / Portal	Description
1	https://archive.nptel.ac.in/courses/103/103/103103144/	Video Lectures
2	https://archive.nptel.ac.in/courses/103/106/103106070/	Video Lectures
3	https://archive.nptel.ac.in/courses/103/104/103104151/	Video Lectures
4	https://unacademy.com/course/part-1-thermodynamics-chemical-	Video Lectures
5	https://unacademy.com/course/part-ii-chemical-engineering-	Video Lectures

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