Maharashtra State Board of Technical Education, Mumbai

K-2

LABORATORY PLAN (LP)

Academic Year: 2025-26

Date: 09/12/2025

Institute Name & Code: K. K. Wagh Polytechnic, Nashik-3 (0078) Class: FYCH
Program and Code: Chemical Engineering (CH) Course Index: CO202
Course Name: Solid Fluid Operations Course Code &. Abbr.: 312342(SFO)
Total Hrs: 45 Semester: II[nd] Scheme: K Name of Faculty: Mrs. J. H. Nihalani

- **INDUSTRY EXPECTED OUTCOME**

The aim of this course is to help the student to attain the industry identified competency through various teaching learning experiences:

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

- CO202.1 - Use different size reduction equipment such as Jaw crusher, Hammer mill, Ball mill etc. in given chemical process industry.
- CO202.2 - Use the relevant separation methods for solid-solid separation.
- CO202.3 - Select the relevant method for solid-liquid separations.
- CO202.4 - Select the appropriate method to separate gas-solid mixture.
- CO202.5 - Apply the knowledge of mixing/agitation in given chemical process 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	
312342	Solid Fluid Operation	SFO	DSC	4	-	**4**	2	10	5	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	Explain basic operation of jaw crusher.
LLO 1.2	Calculate particle size distribution
LLO 2.1	Explain basic operation of Hammer mill/Pulverizer
LLO 2.2	Calculate particle size distribution
LLO 3.1	Explain the working of ball mill.
LLO 3.2	Analyze the effect of change of residence time on grinding.
LLO 4.1	Describe the concept of centrifuging of ball mill.
LLO 4.2	Compare operating speed& critical speed of ball mill.
LLO 5.1	Explain the solid-solid separation technique based on size
LLO 5.2	Evaluate the efficiency of screen in separating the solid particles
LLO 6.1	Explain the solid-solid separation technique

LLO 6.2	Enlist the factors affecting the screening operation
LLO 7.1	Explain the solid-solid separation technique based on surface properties
LLO 7.2	Compare different frothing agents, promoters and collectors
LLO 8.1	Explain the solid-solid separation technique based on magnetic properties.
LLO 8.2	Describe the operation of drum separator.
LLO 9.1	Explain the concept of filtration.
LLO 9.2	Describe the working of Plate and Frame filter press.
LLO 10.1	Explain the concept of vacuum filtration.
LLO 10.2	Explain the working of Rotary drum filter.
LLO 11.1	Explain the separation of solids from suspension under gravity
LLO 11.2	Calculate free settling of particle in given suspension
LLO 12.1	Explain the separation of solids from suspension under gravity
LLO 12.2	Describe the concept of hindered settling conditions.
LLO 13.1	Explain the separation of solids from suspension by application of centrifugal force.
LLO 13.2	Describe the operation of basket centrifuge.
LLO 14.1	Describe the separation of solids from gas by application of centrifugal force.
LLO 14.2	Explain the working of cyclone separator
LLO 15.1	Explain the concept of mixing.
LLO 15.2	Describe the operation of ribbon blender
LLO 16.1	Explain the concept of mixing.
LLO 16.2	Explain the operation of sigma mixer.

- **COS, PRACTICAL LABORATORY LEARNING OUTCOME (LLOS) AND MAPPING:**

Pr. No	Relevant COs	Practical Laboratory Learning Outcome (LLO)	Practical Titles	Planned Date		Actual Date Of Completio	Remark/ Assess-ment Date Staff sign
				From	To		
1	CO1	LLO 1.1	* Calculate the efficiency of Jaw crusher for given material.	A 20/12/2025	A 20/12/2025		
				B 18/12/2025	B 18/12/2025		
				C 19/12/2025	C 19/12/2025		
2	CO1	LLO 2.1	Calculate the efficiency of Hammer mill for given material.	A 27/12/2025	A 27/12/2025		
				B 25/12/2025	B 25/12/2025		
				C 26/12/2025	C 26/12/2025		
3	CO1	LLO 3.1	* Calculate the efficiency of ball mill for given material.	A 03/01/2026	A 03/01/2026		
				B 01/01/2026	B 01/01/2026		
				C 02/01/2026	C 02/01/2026		
4	CO1	LLO 4.1	* Calculate the critical speed of ball mill.	A 10/01/2026	A 10/01/2026		
				B 08/01/2026	B 08/01/2026		
				C 09/01/2026	C 09/01/2026		
5	CO2	LLO 5.1	* Calculate effectiveness of screen for given system.	A 17/01/2026	A 17/01/2026		
				B 15/01/2026	B 15/01/2026		
				C 16/01/2026	C 16/01/2026		
6	CO2	LLO 6.1 LLO 6.2	Use Vibrating Screen/Sieve Shaker/Flip flow screen for separation of given solid mixture.	A 24/01/2026	A 24/01/2026		
				B 22/01/2026	B 22/01/2026		
				C 23/01/2026	C 23/01/2026		
7	CO3	LLO 11.1	* Perform the batch sedimentation test by using different concentrations of calcium carbonate slurry (<5% weight) and find terminal settling velocity	A 31/01/2026	A 31/01/2026		
				B 29/01/2026	B 29/01/2026		
				C 30/01/2026	C 30/01/2026		

8	CO3	LLO 12.1	Perform the batch sedimentation test using different concentration of calcium carbonate (>5% weight) slurry and find terminal settling velocity.	A 07/02/2026 B 05/02/2026 C 06/02/2026	A 07/02/2026 B 05/02/2026 C 06/02/2026		
9	CO3	LLO 13.1	* Calculate % recovery of solid from given slurry by using basket centrifuge.	A 14/02/2026 B 12/02/2026 C 13/02/2026	A 14/02/2026 B 12/02/2026 C 13/02/2026		
10	CO4	LLO 14.1	* Calculate % separation efficiency of Cyclone Separator for given solid-gas mixture.	A 21/02/2026 B 26/02/2026 C 20/02/2026	A 21/02/2026 B 26/02/2026 C 20/02/2026		
11	CO5	LLO 15.1	* Use ribbon blender for finding mixing index for granular solids.	A 28/02/2026 B 05/03/2026 C 27/02/2026	A 28/02/2026 B 05/03/2026 C 27/02/2026		
12	CO5	LLO 16.1 LLO 16.2	* Use Sigma mixer for finding out mixing index.	A 07/03/2026 B 12/03/2026 C 06/03/2026	A 07/03/2026 B 12/03/2026 C 06/03/2026		
13	----	----	Other than Syllabus	A 14/03/2026 B 12/03/2026 C 13/03/2026	A 14/03/2026 B 12/03/2026 C 13/03/2026		

- **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	Blake Jaw Crusher :3HP Motor 2.2 kW	1
2	Hammer Mill/Pulverizer	2
3	Ball Mill DC Motor3HP Motor 2.2 kW	3,4
4	Set of sieves	1,2,3,5
5	Sieve shaker/Vibrating Screen/Flip flow screen	1,2,3,6
6	Froth Flotation Cell	7
7	Magnetic Drum Separator	8
8	Plate and Frame Filter press	9
9	Vacuum filter	10
10	Measuring cylinder of one lit capacity	11,12
11	Basket Centrifuge 3HP Motor 2.2 kW	13
12	Cyclone Separator	14
13	Ribbon Blender	15
14	Sigma Mixer 3HP Motor 2.2 kW	16
15	Weighing Balance (Digital Display, 1kg, Sensitivity. 0.1 g)	All
16	Stop Watch (Analogue)	All

- **SUGGESTED LEARNING MATERIALS / BOOKS**

Sr. No.	Author	Title of Book	Publication
1	Unit Operations of Chemical Engineering	McCabe W. L. Smith Julian C. Harriot Peter	McGraw Hill International; 2010; ISBN: 007-124710-6
2	Introduction to Chemical Engineering	Ghosal S. K., Sanyal Shyamal K., Datta S.	Tata McGraw Hill Publications; 2006;ISBN: 0-07-460140-7
3	Unit Operations of Chemical Engineering	Walter L. Badger, Julius T. Banchero	McGraw Hill International, 1955; ISBN: 9780070850279
4	Mechanical Operations	Swain Anup K., Patra Hemlata, Roy G. K.	McGraw Hill Publication; 2010; ISBN-10: 0070700222
5	Fundamentals of Chemical Engineering	S.N. Saha	Dhanpat Rai Publishing Co. New Delhi, 2012, ISBN:81-87433-55-8

- **LEARNING WEBSITES & PORTAL**

Sr. No	Link / Portal	Description
1	https://www.youtube.com/watch?v=ldhRvlU1G70&t=21s	Working of Ball Mill
2	https://www.youtube.com/watch?v=-BHmsjvnm_4	Working of Hammer Mill
3	https://www.youtube.com/watch?v=EfTcfQY4kEY	Working of Plate & Frame filter
4	https://www.youtube.com/watch?v=npiTNdapr7w	Working of Conveyor
5	https://www.youtube.com/watch?v=fHj8djUc3og	Description of Cyclone separator
6	https://www.youtube.com/watch?v=fHj8djUc3og	Froth Flotation Process
7	https://www.youtube.com/watch?v=N2f5X1wkbvQ	Different types of Mill
8	https://www.youtube.com/watch?v=e0i3mxc79yI	Sigma Blade Mixer

Mrs. J. H. Nihalani
(Name & signature of staff)

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(Name & signature of HOD)