

LABORATORY PLAN (LP)**Academic Year: 2026-27**

Date: 01/07/2026

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

Class: TYCH

Program and Code: Chemical Engineering (CH)

Course Index: CO306

Course Name: INTRODUCTION TO RENEWABLE ENERGY

Course Code & Abbr.: 315311(IRE)

Total Hrs: 30

Semester: 5th

Scheme: K

Name of Faculty: Dr. S S Rikame

- INDUSTRY EXPECTED OUTCOME**

Supervise the operation of different renewable energy equipment in order to preserve conventional energy

- COURSE LEVEL LEARNING OUTCOMES (COS)**

- CO507.1 - Undertake the operation of wind mill for generation of electricity.
- CO507.2 - Use solar system for different application
- CO507.3 - Differentiate sources of energy from biomass.
- CO507.4 - Measure the amount of electricity produce using micro-hydro power plant.
- CO507.5 - Compare tidal energy & geothermal energy.

- 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		
				CL	TL	LL					FA-TH	SA-TH	Total		FA-PR		SA-PR		SLA		
													Max	Min	Max	Min	Max	Min	Max	Min	
315311	INTRODUCTION TO RENEWABLE ENERGY	IRE	DEC	4	-	2	-	6	2	03	30	70	100	40	25	10	25#	10	-	-	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	LLO 1.1 Calculate the efficiency of wind turbine for different load
LLO 2.1	LLO 2.1 Simulate wind turbine using simulation software
LLO 3.1	LLO 3.1 Calculate the efficiency of PV cell for different intensity of light
LLO 4.1	LLO 4.1 Calculate the parameter using different flow rates
LLO 5.1	LLO 5.1 Measure the weight of given sample LLO 5.2 Calculate the percentage of carbon present in given sample
LLO 6.2	LLO 6.1 Measure weight of given sample using specific gravity bottle LLO 6.2 Calculate API gravity, it magnifies the specific gravity
LLO 7.1	LLO 7.1 Calculate the heat energy in the given sample
LLO 8.2	LLO 8.1 Calculate the percentage water content in the given sample to improve the burning quality of fuel
LLO 9.1	LLO 9.1 Simulate hydropower plant using simulation software
LLO 10.1	LLO 10.1 Estimate the energy by simulating geothermal energy source using Organic Rankine Cycle

● **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/ Assessment Date with Staff sign
				From	To		
1	CO1	LLO 1.1	Calculate the efficiency of wind turbine for different load	A-15/08/26	A-15/08/26		
2	CO1	LLO2.1	Simulate wind turbine using simulation software	A-22/08/26	A-22/08/26		
3	CO2	LLO 3.1	Calculate the efficiency of PV cell for different intensity of light	A-29/08/26	A-29/08/26		
4	CO2	LLO 4.1	Calculate the parameter using different flow rates	A-05/09/26	A-05/09/26		
5	CO3	LLO 5.1	Measure the weight of given sample	A-12/09/26	A-12/09/26		
6	CO3	LLO 5.2	Calculate the percentage of carbon present in given sample	A-19/09/26	A-19/09/26		
7	CO3	LLO 6.1	Measure weight of given sample using specific gravity bottle	A-26/09/26	A-26/09/26		
8	CO3	LLO 6.2	Calculate API gravity, it magnifies the specific gravity	A-03/10/26	A-03/10/26		
9			Practical Beyond Syllabus	A-10/10/26	A-10/10/26		

● **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	Small wind turbine (laboratory scale of suitable capacity)	1
2	Open source software OpenFAST by National Renewable Energy Laboratory	2
3	Solar PV system (laboratory scale of suitable capacity)	3
4	Flat plate collector solar system (laboratory scale of suitable capacity)	4
5	Conradson Carbon Residue Apparatus ASTM D189 specifications	5

6	Digital weighing balance	5,6,8
7	Specific gravity bottle (10 ml capacity)	6
8	Bomb calorimeter with accessories	7
9	Dean and Stark apparatus	8
10	Open source software DWSIM	9,10

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

Sr. No.	Author	Title of Book	Publication
1	Tushar Ghosh and Mark Prelas	Energy Resources & Systems Volume 2: Renewable Resources	Springer, ISBN 9400714025
2	Earnest, Joshua, Rachel, Sthuthi	Wind Power Technology	PHI Learning, 9789388028509
3	D. P. Kothari, K. C. Singal, Rakesh Ranjan	Renewable Energy Resources & Emerging Technologies	Prentice Hall of India ISBN- 9789389347890
4	S. C. Bhatia, R. K. Gupta	Textbook of Renewable Energy	Woodhead Publishing India Pvt Ltd, ISBN- 978-81-936446-0-7

• **Learning Websites & Portal**

Sr. No.	Link / Portal	Description
1	https://archive.nptel.ac.in/courses/103/103/103103206/	Video Lectures
2	https://archive.nptel.ac.in/courses/121/106/121106014/	Video Lectures
3	https://nptel.ac.in/courses/103103206	Video Lectures
4	https://nptel.ac.in/courses/115105127	Video Lectures
5	https://www.iitr.ac.in/wfw/web_ua_water_for_welfare/education/proceeding_of_short-term_training/diploma/hydropower_dev_engg_elec/lecture_notes/LECTURE_ON_RENEWABLE_ENERGY_SOURCES.pdf	Presentation

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

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