

GANPAT UNIVERSITY					
FACULTY OF DIPLOMA ENGINEERING					
Programme	Diploma		Branch/Spec.	Agricultural Engineering	
Semester	IV		Version	2.0.0.1	
Effective from Academic Year		2026-27	Effective for the Batch admitted in		July 2025
Course Code	1AE4102	Course Name	Non-Conventional Energy Sources		

I. TEACHING, LEARNING AND ASSESSMENT SCHEME																				
Course Type	Course Code	Course Title	Total IKS Hrs for Sem	Learning Scheme					Credits	Examination Scheme										
				Actual Contact Hrs/week			SLH	NLH		TH				PR				SLA		Total
				CL	TL	LL				FA-TH	SA-TH	TOTAL		FA-PR	SA-PR	TOTAL				
												Max	Min			Max	Min	Max	Min	
DSC	1AE4102	Non-Conventional Energy Sources	-	3	0	2	3	8	4	40	60	100	40	30	20	50	20	20	8	170

Abbreviations:	CL- Classroom Learning	TL- Tutorial Learning	LL- Laboratory Learning
	SLH- Self Learning Hour	NLH- National Learning Hour	SLA- Self Learning Assessment
	FA- Formative Assessment (Term work + Mid Exam + Attendance)		SA- Summative Assessment

II. PRE-REQUISITES
Students should possess basic knowledge of physics related to energy, heat, and power, fundamental electrical concepts, elementary agricultural engineering practices, awareness of farm operations and energy use, and basic mathematical calculations with standard units.

III. INDUSTRY / EMPLOYER EXPECTED OUTCOMES
After completing the course, learners will be able to assist in the selection, installation, operation, and maintenance of renewable energy systems such as biogas plants, solar thermal systems, and windmills for agricultural applications.

IV. COURSE LEARNING OUTCOMES
CO-1. Identify and recall different conventional and non-conventional energy sources, their importance, and their applications in agriculture.
CO-2. Explain the principles, constructional details, and working mechanisms of biogas plants, wind energy systems, and solar energy technologies.
CO-3. Demonstrate the selection, installation, and maintenance of renewable energy systems such as biogas plants, windmills, and solar thermal systems for agricultural use.
CO4. Compare and evaluate different renewable energy technologies in terms of efficiency, sustainability, and economic feasibility for farm applications.
CO-5. Assess the impact of energy conservation methods and improved energy-efficient appliances in enhancing sustainability and reducing energy costs in agricultural operations.

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:		
Unit	Content	Hrs.
1	Introduction : Conventional and Non conventional sources of energy. Need, importance and scope of non conventional and alternate energy resources. Biogas and Bio-mass :Bio-gas, Benefits of bio-gas. Technology of biogas. Principles, feedstock, types and design of biogas plants, comparison of designs. Main parts of biogas plants, digester, gas holder, pressure gauge, gas controlling cocks and meter. Selection of biogas model and size. Site selection of biogas plants. Appliances of biogas plant - burner, heating plate, lamps. Operation, trouble shooting and maintenance of biogas plant. Safety measures in biogas plant. Introduction to biomass and farm residue, management and briquetting	7
2	Wind Energy Technology : Introduction, scope and significance. Type and constructional details of windmill - vertical and horizontal axis. Data required for windmill installation such as meteorological data, geohydrological, agricultural and socio- economic data. Site selection of windmill. Maintenance and performance of windmill.	6
3	Solar Energy Technology : Introduction, significance of solar energy, solar spectral and green house effect. Principles of thermal collection and storage. Comparison of flat type collector and concentration or focusing type collectors. Introduction to Spy module, its principle and applications.	6

4	Solar Thermal Systems : Operation, constructional details and maintenance of solar cooker, solar water heater, solar still, solar water pump, SPV system, solar crop dryer etc.	5
5	Energy Conservation: Principles of energy conservation. Familiarization with the different energy conservation appliances and practices, improved cooking stoves, benefits of improved cooking stoves over the traditional cooking stoves.	6

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL

1. Study of solar cooker.
2. Study of solar water distillation.
3. Study of solar water heater.
4. Study of solar photovoltaic lighting system
5. Study of water pumping system.
6. Study of a biogas plants.
7. Study of the working of a windmill.
8. Study of energy saving appliances and their applications

VII. SUGGESTED MICRO PROJECT / ASSIGNMENTS / ACTIVITIES FOR SELF LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

- Study design, capacity, feedstock, and performance of a nearby biogas plant
- Survey solar devices used in farms (cookers, dryers, pumps) and analyze benefits
- Collect basic wind data of a selected location and assess windmill suitability
- Prepare a simple design and working plan of a solar crop dryer for farm produce
- Identify energy-saving appliances used in agriculture and estimate cost savings

VIII. LIST OF INSTRUMENTS / EQUIPMENT / TRAINER BOARD

- Solar Cooker (Box Type / Concentrating Type)
- Solar Water Heater Demonstration Unit
- Solar Still
- Solar Photovoltaic (SPV) Lighting System
- Solar Water Pumping System
- Biogas Plant Model / Trainer
- Windmill Model (Horizontal / Vertical Axis)
- Energy Meter
- Pyranometer / Solar Radiation Meter (Demo)

IX. LIST OF REFERENCE BOOKS

1. Advance in Biogas Technology by O.P.Chawla; Publications & Information Div. ICAR, New Delhi. Solar Energy by S.P. Sukhatme; Tata McGraw-hill Publishing Co. Ltd., New Delhi.
2. Solar Energy Utilization by G.D. Rai; Khanna Publishers, New Delhi.
3. Bio Gas Technology by K.C. Khandelwal&S.S. Mahdi; Tata McGraw-hill Publishing Co. Ltd., New Delhi.
4. Biomass Energy by OECD; Oxford &IBH Publication Co.
5. Wind Energy For water Pumping by Srivastava; Oxford &IBH Publication Co.
- Cook Stoves For Masses by N.S. Grewal; PAU, Ludhiana

X.LINK OF LEARNING WEB RESOURCE

1. Ministry of New and Renewable Energy (MNRE), Govt. of India:<https://mnre.gov.in>
2. National Institute of Solar Energy (NISE):<https://nise.res.in>
3. National Institute of Wind Energy (NIWE):<https://niwe.res.in>
4. Biogas Development & Training Centre (KVIC):<https://www.kvic.gov.in>
5. NPTEL – Renewable Energy & Solar Energy Courses:<https://nptel.ac.in>
6. TNAU Agritech Portal – Renewable Energy in Agriculture: <https://www.agritech.tnau.ac.in>

XI. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE

Unit	Unit Title	Aligned COs	Learning Hours	U-Level	R-Level	A-Level	Total Marks
1.	Conventional & Non-Conventional Energy, Biogas & Biomass	CO1, CO2	7	6	6	3	15
2	Wind Energy Technology	CO2, CO3	6	5	5	5	15
3	Solar Energy Technology	CO2, CO3	6	5	5	5	15

4	Solar Thermal Systems & Applications	CO3, CO4	5	4	5	6	15
5	Energy Conservation & Efficient Appliances	CO4, CO5	6	4	5	6	15

--	--	--	--	--	--	--	--

XII. COs AND POs AND PSOs MAPPING

Course outcome (Cos)	Programme Outcomes (POs)							Programme Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	1	0	0	0	0	1	2	1	0
CO2	3	2	1	0	1	0	0	3	2	0
CO3	2	3	2	1	2	0	0	2	3	1
CO4	1	3	2	2	2	0	1	1	2	2
CO5	1	2	2	1	3	1	2	2	2	2