

GANPATUNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Bachelor of Technology				Branch/Spec.		Chemical Engineering	
Semester		IV				Version		1.0.0.0	
Effective from Academic Year			2025-26			Effective for the Batch admitted in			July 2025
Course Code		2CH4103		Course Name		Sustainable Energy Engineering			
Teaching Scheme						Examination Scheme (Marks)			
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	-	-	-	3	Theory	40	60	100
Hours	3	-	-	-	3	Practical	-	-	-
Pre-requisites									
Not required									
Course Outcomes									
CO 1	Analyze solar radiation, PV, and CSP systems, and evaluate grid integration.								
CO 2	Understand biomass conversion, biofuels production, and geothermal power generation.								
CO 3	Apply wind turbine design principles and analyze hydropower and tidal energy systems.								
CO 4	Examine hydrogen production methods, storage, and fuel cell applications.								
Theory Syllabus									
Unit	Content								Hrs.
1	Solar Energy Technologies: Solar Radiation, Photovoltaic (PV) Technology, PV Cell Materials and Fabrication Techniques, Solar Thermal Energy Conversion Systems, Concentrating Solar Power (CSP) technologies, Design and Performance Analysis of PV and CSP Systems, Integration of Solar Energy Systems into the Grid.								10
2	Bioenergy and Geothermal Energy Systems: Biomass Energy Sources and Conversion Technologies, Biofuels Production, Waste-to-Energy Systems – Combustion (unprocessed and processed fuel), Gasification, Anaerobic digestion, Fermentation, Pyrolysis, Geothermal Heat Extraction and Power Generation, Ground-Source Heat Pumps and Direct Use Applications.								12
3	Wind and Hydropower Systems Engineering: Wind Turbine Technology and Aerodynamics, Wind Resource Assessment and Wind Farm Design Hydropower System Components and Design, Tidal and Wave Energy Conversion Mechanisms.								8
4	Hydrogen and Fuel Cell Technology: Introduction to Hydrogen Energy, Various Hydrogen Production Methods, Advanced Methods of Reforming, Hydrogen Production from Methane Decomposition, From Coal And Biomass, Introduction to Hydrogen Storage, Compression And Expansion, Fuel Cells, Types of Fuel Cells, Component of Fuel Cells, Application of Fuel Cells.								15
Text Books									
1	Renewable Energy Resources: Basic Principles and Applications by G. N. Tiwari and M. K. Ghosal								
2	Boyle, Godfrey. Renewable Energy: Power for a Sustainable Future, Third Edition. Oxford University Press, 2012.								
3	Gupta, R. B., Hydrogen Fuel: Production, Transport and Storage, CRC Press, Taylor & Francis Group, 2009.								
Reference Books									
1	M.M. EL-Halwagi, Biogas Technology- Transfer and diffusion, Elsevier Applied science Publisher, New York, 1984.								
2	Viswanathan, B and M Aulice Scibioh, Fuel Cells – Principles and Applications, Universities Press								
3	“Energy Technology (Non Conventional, Renewable and Conventional)”, Sunil S. Rao and B.B. Parulekar, Khanna Publisher, 1994								
ICT/MOOCs Reference									
1	Video lectures available on NPTEL								
2	Refer softcopies (CD) provided with reference books/textbooks								
Mapping of CO with PO and PSO:									

Mapping of CO with PO and PSO:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	2	-	-	-	1	2	3	1	3
CO2	3	2	1	2	1	2	-	-	-	-	2	3	1	3
CO3	3	3	2	2	2	2	-	-	-	1	2	3	1	3
CO4	3	3	2	2	2	2	-	-	-	1	2	3	2	3