

		National Institute of Technology Meghalaya An Institute of National Importance							CURRICULUM	
Programme		Master of Technology					Year of Regulation		2025	
Department		Civil Engineering					Semester		I	
Course Code	Course Name	Pre-requisite	Credit Structure				Marks Distribution			
			L	T	P	C	INT	MID	END	Total
CE 571	Clean Environmental Technology	NIL	3	0	0	3	50	50	100	200
Course Objectives	1. To introduce the concept of clean and sustainable technologies for environmental protection. 2. To explore pollution prevention strategies through cleaner production and green technologies. 3. To study industrial ecology and waste minimization methods. 4. To understand life cycle assessment and eco-design. 5. To promote integration of renewable energy and environmentally sound technologies in industries.		Course Outcomes	CO1	Able to describe the principles and importance of clean environmental technologies in reducing environmental footprints.					
				CO2	Able to identify and apply cleaner production and pollution prevention strategies across sectors.					
				CO3	Able to evaluate industrial processes using life cycle assessment tools.					
				CO4	Able to recommend renewable and green technologies for energy and waste management.					
				CO5	Able to integrate clean technology concepts into environmental planning and policy frameworks.					
SYLLABUS										
No.	Content							Hours	COs	
I	Introduction to Clean Environmental Technology: Definition and need for clean technologies; Environmental impact of conventional technologies; Principles of pollution prevention; Cleaner production vs. end-of-pipe technologies							6	CO1, CO2	
II	Cleaner Production and Waste Minimization: Source reduction strategies; Energy and water conservation techniques; Raw material substitution; Case studies in textile, food, and chemical industries							6	CO2, CO3, CO4	
III	Industrial Ecology and Eco-Industrial Parks: Industrial metabolism and material flow analysis; By-product synergy and resource recovery; Concept of eco-industrial parks; Circular economy and zero waste concepts							5	CO2, CO3, CO4	
IV	Green Chemistry and Green Engineering: Principles of green chemistry; Process intensification and green synthesis; Sustainable engineering practices in process design; Environmentally benign solvents and catalysts							7	CO2, CO3, CO4	
V	Life Cycle Assessment (LCA) and Eco-Design: Introduction to LCA and ISO 14040 series; LCA phases: goal definition, inventory, impact assessment, interpretation; Tools and software for LCA; Eco-design principles and product redesign							9	CO4, CO5	
VI	Renewable Energy and Sustainable Technologies: Solar, wind, biomass, and biogas technologies; Energy-efficient systems in buildings and industry; Role of clean technologies in climate change mitigation; Policies and incentives promoting clean technologies in India							9	CO4, CO5	
Total Hours								42		
Essential Readings										
1. Allen, D. T. , Shonnard, D. R. Sustainable Engineering: Concepts, Design and Case Studies, Prentice Hall, 2011										
2. Twidell, J. ,Weir, T., Renewable Energy Resources, Routledge, 2019.										
3. S. K. Sharma and A. Mudhoo, Green Chemistry for Environmental Remediation, Hoboken, NJ: Wiley-Scrivener, 2022										
Supplementary Readings										
1. Handbook of Cleaner Production, Elsevier										
2. WHO Guidelines ,Water, Sanitation, and Hygiene (WASH) for Health										
3. D. P. Kothari, K. C. Singal, and R. Ranjan, Renewable Energy Sources and Emerging Technologies, 4th ed. New Delhi, India: PHI Learning, 2024										