National Institute of Technology Meghalaya

An Institute of National Importance

CURRICULUM

Programme	**Bachelor of Technology in Mechanical Engineering**	Year of Regulation	**2021-2022**
Department	**Mechanical Engineering**	Semester	**VII**

Course Code	Course Name		Credit Structure				Marks Distribution			
			L	T	P	C	INT	MID	END	Total
ME 421	**Wind Energy**		**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives	To understand the basics of wind energy conversion technology, wind turbine aerodynamics and design methodology.	Course Outcomes	**CO1**	Ability to understand the basic concept of wind velocity and wind rose diagram, Sources and characteristics of wind and selection of site.
			CO2	Ability to understand the basics of various wind turbines, characteristics and construction methods of wind mills.
			CO3	Ability to understand the various rotor blade profile, cross section and forces acting on wind turbines.
			CO4	Ability to understand the hybrid power systems, energy storage, operation and maintenance cost, and value of wind energy.

No.	COs	Mapping with Program Outcomes (POs)									Mapping with PSOs				
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	CO1	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**1**
2	CO2	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**1**
3	CO3	**3**	**3**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**1**
4	CO4	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**1**
5	CO5	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
6	CO6	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

SYLLABUS

No.	Content	Hours	COs
I	**Introduction**: Wind energy scenario in India, Properties of wind, Wind velocity and wind rose diagram, Sources and characteristics of wind, Wind Measurement and Instrumentation, Selection of site, Estimation of power in wind.	**08**	**CO1**
II	**Classification and Wind Turbine Design:** Wind Characteristics and Resources, Types of wind turbines, wind pumps, Offshore wind turbines and construction of wind mills, Wind Turbine Design Loads, Blade Design for Modern Wind Turbines, Power Curve Prediction.	**09**	**CO2**
III	**Aerodynamics of Wind Turbines:** Airfoils and General Concepts of Aerodynamics, Effect of Drag and Blade Number on Optimum Performance, Rotor blade profile and cross section for horizontal axis and vertical axis wind turbines, Forces acting on wind turbines, Wind Turbine Materials and Components, Electrical Aspects of Wind Turbines, Computational and Aerodynamic Issues in Aerodynamic Design.	**10**	**CO3**
IV	**Wind Energy Applications and System Economics:** Hybrid power systems, Operation in severe climates, Energy storage, Capital costs of wind energy systems, Operation and maintenance cost, Wind Energy Applications, Wind Energy System Economics, Environmental Aspects and Impacts.	**09**	**CO4**
	Total Hours	**36**	

Essential Readings

1. J.F. Manwell, J.G.MC Gowan, A.L.Rogers, "Wind Energy Explained-Theory, Design and Application" 2nd Edition, Wiley
2. D A Spera, (Ed.), "Wind Turbine Technology", ASME, 1994

Supplementary Readings

1. J F Walker, and N Jenkins, "Wind Energy Technology", John Wiley and Sons, 1st Edition, 1997.