National Institute of Technology Meghalaya

(An Institute of National Importance)

CURRICULUM

Programme	**Bachelor of Technology in Electrical and Electronics Engineering**	Year of Regulation	**2019-20**
Department	**Electrical Engineering**	Semester	**V**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
EE 315	**Energy Technology and Management**	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives	Course Outcomes		
To create awareness about sources of energy and able to estimate how long the available conventional fuel reserves will last.	CO1	To understand the main sources of energy and non-conventional energy sources, their primary applications in India and the world.
To understand the various renewable energy sources and their applications.	CO2	To gain knowledge on exploiting non-conventional and renewable sources of energy; and storage technologies.
To understand energy management strategies and challenges of integrating the renewables into the electric grid.	CO3	To understand energy audit and management system.

No.	COs	Mapping with Program Outcomes (POs)												Mapping with PSOs		
		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	CO1	**3**	**1**	**1**	**2**	**1**	**1**	**3**	**1**	**0**	**0**	**0**	**0**	**3**	**0**	**0**
2	CO2	**3**	**3**	**3**	**3**	**2**	**1**	**3**	**1**	**0**	**0**	**0**	**0**	**3**	**0**	**0**
3	CO3	**3**	**3**	**3**	**3**	**2**	**1**	**3**	**1**	**0**	**0**	**0**	**0**	**3**	**0**	**0**

SYLLABUS

No.	Content	Hours	COs
I	**Introduction To Energy Resources** Energy, Energy resources and forms of energy, Energy demand, World energy resources, Indian energy scenario, environmental aspects of energy utilization, Non-Conventional Energy Resources, renewable energy resources and their importance, Energy Management, Energy crisis, Environmental aspects.	**04**	**CO1**
II	**Solar Energy and Photovoltaic Systems** Introduction, nature of solar energy, solar cell energy conversion, efficiency, characteristics, effect of variation of solar insolation and temperature, Local apparent time, methods of calculation, losses, components of PV	**04**	**CO2**

	systems, solar PV power plants, V-I characteristics of solar cell, PV cell technology, Solar-thermal systems, Hybrid power plant.		
III	**Wind Energy** Overview, Power in wind, Aerodynamics, Types of turbine, wind turbine blade, Various aspects of wind turbine design, Power coefficients Vs. Tip speed ratio for various turbine, Wind power conversion technologies, , Wind turbine generators: induction, synchronous machine, Constant V & f and Variable V & f generations.	**04**	**CO2**
IV	**Bio Energy** Introduction, Availability, Conversion processes, Biogas generation, , Anaerobic digestion, factors affecting biogas generation, Thermochemical conversion, Biochemical conversion, Fermentation, Types of biogas plant, Biogas scenario in India.	**04**	**CO2**
V	**Hydel Energy** Classification of hydel plants, Concept of micro hydel, MHP plants: components, design and layout, turbines, efficiency, status in India.	**03**	**CO2**
VI	**Nuclear Energy** International nuclear energy policies and regulations, nuclear energy technologies –fuel enrichment, different types of nuclear reactors, nuclear waste disposal, and nuclear fusion.	**04**	**CO2**
VII	**Energy Storage & Fuel Cells** Introduction, Battery energy storage system, Compressed air energy storage, Superconducting magnet energy storage, Fuel cell power sources, Electrical circuits, Performance characteristics, Prospects of fuel cell power plants.	**04**	**CO2**
VIII	**Ocean Thermal Energy Conversion & Tidal Energy** Introduction, off-shore & On-shore ocean energy conversion, Principle of OTEC power plants, India's first OTEC plant, Wave energy, Tidal power plants, Classification, advantages & limitations.	**04**	**CO2**
IX	**Energy Management System** EMS, Energy Audit & types, Energy crisis, Energy planning, Energy exploited & energy demand, Energy demand management, End use energy consumption profile.	**05**	**CO3**
Total Hours		**36**	

Essential Readings

1. Andrews J, Jelley N, "Energy Science", Oxford University Press, 3rd edition, 2017.
2. B H Khan, "Non-Conventional Energy Resources", Tata McGraw-Hill Education, 1st edition, 2006.
3. Godfrey Boyle, "Renewable Energy", Oxford University Press, 3rd Edition, 2012.
4. S. Rao, B.B. Parulekar, "Energy Technology", Khanna Publishers, 3rd Edition, 2018 (Reprint)

Supplementary Readings
1. D.P. Kothari, K.C. Singal, R. Ranjan, “Renewable Energy Sources and Emerging Technologies” 2nd Edition, PHI, 2011.
2. G.D. Rai, “Non-Conventional Energy Sources, Khanna Publishers, 6th Edition, 1988.