	National Institute of Technology Meghalaya An Institute of National Importance		CURRICULUM
Programme	**Bachelor of Technology in Civil/Mechanical/Computer Science/Electronics and Communication Engineering**	Year of Regulation	**2018-19**
Department	**Electrical Engineering**	Semester	**VII**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
EE 471	**Non-Conventional Energy Resources**	**2**	**0**	**0**	**2**	**50**	**50**	**100**	**200**

Course Objectives		Course Outcomes		
	This course familiarizes different types of non-conventional energy sources, and their usage		CO1	**Able to understand the impact of fossil fuel, importance of non-conventional energy sources, hybrid energy systems**
	This course explains the principle of operation of different non-conventional energy sources		CO2	**Able to analyse and evaluate the utilization, application and principles of solar energy**
	This course illustrates the applications, advantages and disadvantages of solar, wind and other types of non-conventional energy sources		CO3	**Able to analyse and evaluate the utilization, application and principles of wind energy**
			CO4	**Able to analyse and evaluate the utilization, application and principles of biomass and wave 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	PSO3
1	CO1	**3**	**1**	**0**	**0**	**0**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**
2	CO2	**3**	**1**	**1**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**3**	**1**	**0**
3	CO3	**3**	**1**	**1**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**3**	**1**	**0**
4	CO4	**3**	**1**	**1**	**0**	**0**	**0**	**2**	**0**	**0**	**0**	**0**	**0**	**3**	**1**	**0**

SYLLABUS

No.	Content	Hours	COs
I	**Introduction** **Fossil fuel based systems. Impact of fossil fuel based systems. Non-conventional energy – Seasonal variations and availability. Renewable energy – sources and features. Hybrid energy systems**	**2**	**CO1**
II	**Solar Energy** **Solar radiation spectrum. Radiation measurement. Solar Photovoltaic System: Operating principles. Photovoltaic cell concepts. Cell, module, array. Series and parallel connections. Maximum power point tracking. Applications**	**8**	**CO2**
III	**Wind Power** **Nature of wind-Basic components of Wind Energy Conversion System(WECS)-Wind energy collectors: Horizontal and vertical axis rotors- Advantages and Disadvantages of WECS - Applications of wind energy.**	**6**	**CO3**
IV	**Wave energy and Biomass** **Ocean Energy: Ocean thermal electric conversion (OTEC) methods, Principles of tidal power generation-Advantages and limitations** **Biomass: Operating principles, Applications, Advantages and Disadvantages**	**5**	**CO4**
V	**Hybrid Energy Systems** **Need for Hybrid Systems, Range and type of Hybrid systems ,Case studies**	**3**	**CO1**
Total Hours		**24**	

Essential Readings

1. G.D. Rai, Non-Conventional Energy Sources ,Khanna Publishers, New Delhi, 2011.
2. S. Rao and Dr. B.B. Parulekar, Energy Technology, Non convential, Renewable and Conventional, Khanna Publishers, 3rd Edition, 1994

Supplementary Readings

1. B. H Khan, Non-Conventional Energy Resources, McGraw Hill, 2nd Edition, 2009.
2. D.S. Chauhan and S.K. Srivastava, *Non- Conventional Energy Resources*, New Age International Pvt Ltd, 3rd Edition, 2013
3. G.N. Tiwari, *Fundamentals of Renewable Energy Sources*, Narosa Publishing House, 1st Edition, 2007