	National Institute of Technology Meghalaya (An Institute of National Importance)		CURRICULUM
Programme	**Bachelor of Technology in Electrical and Electronics Engineering**	Academic Year of Regulation	**2018-2019**
Department	**Electrical Engineering**	Semester	**VIII**

Course Code	Course Name	Credit Structure				Marks Distribution			
		L	T	P	C	INT	MID	END	Total
EE 418	**Smart Grid Technology**	**3**	**0**	**0**	**3**	**50**	**50**	**100**	**200**

Course Objectives		Course Outcomes		
	To teach the basic concepts, components and architecture of smart grid.		CO1	Able to understand the features and architecture of Smart Grid.
	To familiarize the students with the new technologies for grid interfaced DG system with storages.		CO2	Able to assess the role of automation in transmission and distribution.
	To explain the communication technologies and the cyber-security threats in Smart Grid.		CO3	Able to understand and analyse the operation of DG and storage technologies.
	To teach the fundamental requirements for planning ancillary services in Smart Grid.		CO4	Able to understand the communication technologies and cyber-security in Smart Grid.
			CO5	Able to understand the planning, operation, control and analysis of Smart Electric Grid.

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**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**3**	**0**	**0**
2	CO2	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**3**	**0**	**1**
3	CO3	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**1**	**0**	**1**	**0**	**1**	**3**	**0**	**2**
4	CO4	**3**	**3**	**3**	**3**	**3**	**1**	**0**	**1**	**0**	**0**	**0**	**0**	**3**	**0**	**3**
5	CO5	**3**	**3**	**3**	**3**	**3**	**1**	**2**	**1**	**0**	**2**	**0**	**0**	**3**	**0**	**3**

SYLLABUS

No.	Content	Hours	COs
I	**Introduction to Smart Grid:** Introduction, Definition of smart grid, Concept of smart grid structure, Conventional grid Vs. Smart grid, Opportunities & Barriers of Smart Grid, Enablers of smart grid, Smart-grid activities in India, Key Challenges for Smart Grid.	**06**	**CO1**
II	**Smart Grid Architecture:** Components and Architecture of Smart Grid Design, Review of the proposed architectures for Smart Grid, Advanced metering infrastructure, The fundamental components of Smart Grid designs –Transmission Automation –Distribution Automation –Renewable Integration.	**06**	**CO1, CO2**
III	**Distribution Generation Technologies:** Introduction, Introduction to Renewable Energy Technologies, Micro grids, Storage Technologies – Electric Vehicles and PHEVs, Environmental impact and Climate Change, Economic Issues.	**08**	**CO3**
IV	**Communication Technologies and Smart Grid:** Introduction to Communication Technology – Two way digital communications paradigm, Synchro-Phasor Measurement Units (PMUs), Wide Area Measurement Systems (WAMS), Introduction to Internet of things (IOT) - Applications of IOT in Smart Grid, Cyber Security for Smart Grid.	**08**	**CO4**
V	**Smart Grid Planning** Planning aspects of smart grid, Operation and control of AC, DC & hybrid smart grid, Demand side management- Demand response, Energy management, Planning of smart grid systems.	**08**	**CO5**
	Total Hours	**36**	

Essential Readings

1. J. Ekanayake, N. Jenkins, K. Liyanage, J.Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley, 1st Edition, 2012.
2. Stuart Borlase, Smart Grids, Infrastructure, Technology and Solutions, CRC Press, 1st edition, 2012.
3. Ali Keyhani, "Design of smart power grid renewable energy systems", Wiley IEEE, 3rd Edition, 2019.

Supplementary Readings

1. A.G. Phadke and J.S. Thorp, "Synchronized Phasor Measurements and their Applications", Springer Edition, 2nd Edition, 2017
2. J. A. Momoh, "Smart Grid: Fundamentals of Design and Analysis," Wiley-IEEE Press, 1st Edition, March 2012.