SMART GRID TECHNOLOGIES

Course Code	20EE4703A	**Year**	IV	**Semester(s)**	I
Course Category	Professional Elective-V	**Branch**	EEE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	EPGT&D and PSA
Continuous Internal Evaluation:	30	**Semester End Evaluation:**	70	**Total Marks:**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	**Understand** the concepts of smart grid technologies. (L2)
CO2	**Apply** the smart grid techniques and smart metering infrastructure to meet the needs of utility(L3)
CO3	**Apply** load flow and contingency methods for smart grid. (L3**)**
CO4	**Apply** the concepts of computational tools for smart grid (L3)
CO5	**Examine** the interoperability and cyber security of smart grid (L4)
CO6	**Create** a frame work for knowledgeable power engineers to operate the grid more effectively and submit a report.

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3					3						3	3	3
CO3	3				1							1	3	3
CO4	2		2		1	2						1	3	3
CO5		3		2				2				2	3	3
CO6	3				3				3	3		3	3	3

SYLLABUS		
Unit No.	**Contents**	**Mapped CO**
I	**Introduction to Smart Grid:** Smart grid definition, benefits, comparison of traditional grid and smart grid, stakeholders in smart grid development, functions of smart grid components, computation intelligence, comparison between micro grid and smart grid	**CO1 CO2 CO6**

II	**Communication and Measurement:** Introduction, wide area monitoring system, comparison of conventional and smart metering, benefits of smart meters, functional block diagram of a smart meter architecture, advanced metering infrastructure, GIS technology, MAS technology.	**CO1** **CO2** **CO6**
III	**Performance Analysis Tools For Smart Grid Design:** Challenges to load flow in smart grid , load flow state, contingency studies for the smart grid, steady state contingency analysis, performance indices, sensitivity based approaches.	**CO1** **CO3** **CO6**
IV	**Computational Tools for Smart Grid:** Introduction to computational tools, decision support tools, optimization techniques, heuristic optimization, evolutionary computational techniques, hybridizing optimization techniques and applications to the smart grid.	**CO1** **CO4** **CO6**
V	**Interoperability and Cyber Security:** Introduction to interoperability, benefits and challenges of interoperability, model for interoperability in the smart grid environment, smart grid network interoperability, interoperability and control of the power grid, smart grid cyber security, cyber security risks, cyber security concerns associated with AMI, mitigation approach to cyber security risks.	**CO1** **CO5** **CO6**

Learning Resources
Text Books
1. James Mamoh, "Smart Grid – Fundamentals of design and analysis", John Wiley & sons, inc..Publication First Edition 2012. 2. Janaka Ekanakye, "Smart Grid Technology and Application", John Wiley & sons, inc Publication, First Edition 2012.
Reference Books
1. Jennie C.Stephens," Smart grid - Evolution",Cambridge University Press, First Edition 2015. 2. Andries P. Engelbrecht , "Computational Intelligence - An Introduction", John Wiley & Sons, Ltd, First Edition 2002. 3. Devendra K. Chaturvedi ,"Soft Computing- Techniques and its Applications in Electrical Engineering", Springer 2008.
e-Resources
1. https://nptel.ac.in/courses/108107113