**19EE41E4-SMART GRID TECHNOLOGY**

**(EEE)**

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| **Course Category:** | Professional Elective | **Credits:** | 3 |
| **Course Type:** | Theory | **Lecture-Tutorial-Practical:** | 3-0-0 |
| **Pre-requisite:** | Power systems, Power system analysis & switchgear and protection. | **Sessional Evaluation:**  **External Exam Evaluation:**  **Total Marks:** | 40  60  100 |

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| **Course Objectives:** | Students undergoing this course are expected to learn: | |
| 1. The introduction to Smart Grid 2. The necessity of smart grid 3. The operation and construction of measuring the smart grid signals 4. The automation technologies of smart grid 5. The Island, protection and applications of smart grid 6. Thedistributed Energy Resources | |
| **Course Outcomes:** | After completing the course the student will be able to | |
| **CO1** | Gain the knowledge on introduction to smart grid. |
| **CO2** | Demonstrate the necessity of smart grid. |
| **CO3** | Enumerate the operation and construction of measuring the smart grid signals. |
| **CO4** | Interpret the automation technologies of smart grid |
| **CO5** | Describe on island, protection and applications of smart grid. |
| **CO6** | Understand the concepts on distributed energy resources |
| **Course Content:** | **UNIT-I**  **Introduction to smart grid:** Introduction to smart grid- Electricity network-Local energy networks- General considerations for a smart grid, characteristics of smart grids, elements in smart grids. Electric transportation- Low carbon central generation-Attributes of the smart grid- Alternate views of a smart grid.  **UNIT-II**  **Smart grid to evolve a perfect power system:** Introduction- Overview of the perfect power system configurations- Device level power system- Building integrated power systems- Distributed power systems- Fully integrated power system-Nodes of innovation.  **UNIT –III**  **Smart electric grid:** Smart electric grid: generation Distributed energy resources: Renewable energy, energy storage, solar energy, wind energy, biomass, hydro power, geothermal and fuel cell, effect of electric vehicles(EV’s), transmission, distribution, and end-user; Basic concepts of power, load models, load flow analysis.  **UNIT –IV**  **Measurement technologies:** Wide area monitoring system (WAMS), advanced metering infrastructure (AMI), phasor measurement units.  **UNIT –V**  **Communication & networking technology:** Architectures, standards and adaptation of power line communication (PLC), zigbee, GSM, and more; machine to-machine communication models for the smart grid; Home area networks (HAN) and neighborhood area networks (NAN)  **UNIT-VI**  **Energy management in smart grids:** Aspects of energy management in the smart grid; SCADA; micro grids; demonstration projects; case studies. Policy and economic drives of the smart grid; environmental implications; sustainability issues; state of smart grid implementation. | |
| **Text books**  **&**  **Reference books:** | **Text books:**  1.“The smart grid: Enabling energy efficiency and demand response”,  by Clark W. Gellings, - CRC Press.  2.“Smart grid: technology and applications”, by JanakaEkanayake,  N. Jenkins, K. Liyanage, J. Wu, Akihiko Yokoyama - Wiley.  **Reference books:**  1.“Smart grids”, by Jean Claude Sabonnadiere, NouredineHadjsaid–  Wiley Blackwell.  2.“Securing the smart grid” by Tony Flick and Justin Morehouse-  Elsevier Inc.  3.“Smart power: climate change, the smart grid, and the future of  electric utilities”, by Peter S. Fox-Penner - Island Press.  4.“SMART GRID: Fundamentals of design and analysis”, by James  Momoh- IEEE press, A John Wiley & Sons, Inc., Publication. | |
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