

EE 713: ADVANCE TECHNOLOGIES FOR SMART ELECTRIC GRIDS (3-0-0:3)

Renewable Energy Technology & Its Control

Distributed energy resources and micro grid, wind & solar power generation, geothermal energy, hydro power, storage technology, renewable energy sources (RES) integrated to grid, stability issues, Routh Hurwitz stability criterion, control loops of hybrid system and micro grid, load frequency control in presence of RES, load modelling, Multi-area power system with RES, types of ancillary services, poolco and bilateral transaction, electric market mechanism and bidding.

Demand Side Management Technology

Introduction, demand side management (DSM), demand response (DR) and dynamic demand response (DDR), planning and implementation strategy, load shape objectives, DSM regulations and policies, essential & non-essential loads, commercial building as a demand response, necessity of smart meter for DSM, smart meter and types, current scenario in India and abroad, challenges in implementing DSM, frequency regulation (FR) using DSM.

Vehicle-to-Grid Technology

Vehicle-to-grid (V2G) infrastructure, basic structure of V2G in existing power system, Electric vehicles (EV) characteristics and impacts, driving characteristics, EV fleets modelling, EV aggregator, primary reserve calculations for frequency control, SOC calculations, frequency regulation using EV/PHEV, integration of EVs to radial distribution network, charging/discharging of EV in presence of renewable sources, skepticism and current improvement in V2G structure, current pilot projects.

Transactive Energy

Introduction of transactive energy (TE), transactive energy attributes, transactive energy principles, evolution of the grid and its impact on transactive energy, elements of TE, framework, policy and market design.

References:

1. P Kundur, "Power System Stability and Control", Tata McGraw Hill.
2. G. Boyle, "Renewable Energy: Power for Sustainable Future", Oxford.
3. J. Mamoh, "Smart Grid: Fundamentals of Design and Analysis", Wiley.
4. C. W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press.
5. S. Barrager and E. Cazalet, "Transactive Energy: A Sustainable Business and Regulatory Model for Electricity", Baker Street Publishing.