EE528: SMART GRID TECHNOLOGY (3-0-0: 3)

Introduction to Smart Grid

Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self Healing Grid, Present development & International policies in Smart Grid. Case study of Smart Grid. CDM opportunities in Smart Grid.

Smart Grid Technologies: Part 1

Introduction to Smart Meters, Real Time Prizing, Smart Appliances, Automatic Meter Reading(AMR), Outage Management System(OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation, Phase Shifting Transformers.

Smart Grid Technologies: Part 2

Smart Substations, Substation Automation, Feeder Automation. Geographic Information System(GIS), Intelligent Electronic Devices(IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System(WAMS), Phase Measurement Unit(PMU).

Microgrids and Distributed Energy Resources

Concept of microgrid, need & applications of microgrid, formation of microgrid, Issues of interconnection, protection & control of microgrid. Plastic & Organic solar cells, Thin film solar cells, Variable speed wind generators, fuel cells, micro-turbines, Captive power plants, Integration of renewable energy sources.

Power Quality Management in Smart Grid

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

Information and Communication Technology for Smart Grid

Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighborhood Area Network (NAN), Wide Area Network (WAN). Bluetooth, ZigBee, GPS, Wi-Fi, Wi-Max based communication, Wireless Mesh Network, Basics of CLOUD Computing & Cyber Security for Smart Grid. Broadband over Power line (BPL). IP based protocols.

Text Books and References

1. J. Ekanayake, N. Jenkins, K. Liyanage, J. Wu, Akihiko Yokoyama, “Smart Grid: Technology and Applications”, Wiley.
2. S. Chowdhury, S. P. Chowdhury, P. Crossley, “Microgrids and Active Distribution Networks”, Institution of Engineering and Technology.
3. S. Borlase, “Smart Grids (Power Engineering)”, CRC Press.
4. A. Keyhani, M. N. Marwali, M. Dai, “Integration of Green and Renewable Energy in Electric Power Systems”, Wiley
5. C. W. Gellings, “The Smart Grid: Enabling Energy Efficiency and Demand Response”, CRC Press
6. A. Carvallo, J. Cooper, “The Advanced Smart Grid: Edge Power Driving Sustainability: 1”, Artech House Publishers.

7. M. Kezunovic, M. G. Adamiak, A. P. Apostolov, J. G. Gilbert, “Substation Automation (Power Electronics and Power Systems)”, Springer
8. R. C. Dugan, M. F. McGranghan, S. Santoso, H. W. Beaty, “Electrical Power System Quality”, McGraw Hill Publication
9. Y. Xiao, “Communication and Networking in Smart Grids”, CRC Press.
10. J. C. Sabonnadière, N. Hadjsaïd, “Smart Grids”, Wiley Blackwell.