ELEC-E8423 Smart Grid - Course topics 2022

1. **Wind power generation variation and its modeling. Niemelä Arttu (22.3.)**
2. Solar power generation variation and its modeling.
3. **Role of DR, storages and hydrogen in future energy systems. Markkanen Laura & Heinonen Heta (15.3.)**
4. **Battery energy storage systems. Saari Sampo & Niklander Eero (29.3.)**
5. **Compressed air energy storages. Harjunpää Sakari & Niutanen Mikael (29.3.)**
6. **Pumped hydro energy storages. Tiira Timi & Porru Carlo (29.3.)**
7. **Power to gas applications. Kerttula Joona & Kaijomaa Henri (15.3.)**
8. **Thermal heat storages for daily and seasonal use. Turpeinen Atte & Salonen Sami (15.3.)**
9. **Fuel cells as a part of power system. Lucenius Frans & von Mikulicz-Radecki Flora Marianne**
10. **Electric vehicles and their charging systems. Kaur Laura & Kontto Eemeli (22.3.)**
11. **Modelling of Electric Vehicle charging load. Ohrankämmen Iina & Haapanen Kasperi (22.3.)**
12. **Demand response of EV loads. Arilla Sai Dharmesh**
13. Demand response of HVAC loads.
14. **Electrical energy use in residential buildings. Flexibility and DR potential of different energy uses. Hu Xinyi**
15. **DR limitations set by human comfort requirements. Heat gains, heating and cooling, and demand flexibility. Wegener Fabian & Chen Minzhou**
16. **Demand response of industrial loads. Korhonen Severi & Irrmann Lionel (22.3.)**
17. **Demand response of commercial loads. Vasama Aaro & Grönblad Markus (19.4.)**
18. Self-healing networks; automatic switching applications (FLIR).
19. Methods for fault location and detection in SG.
20. Distribution system state estimation in SG
21. Dynamic thermal rating of SG components
22. Monitoring and control of secondary substations
23. Communication solutions for SG.
24. AMR – systems in SG (Automatic Meter Reading).
25. **Power markets in Nordic Countries: Day ahead market and intra-day balancing. Kovalainen Jenni & Ryhänen Anette (5.4.)**
26. **Power markets in Nordic Countries: Freq. containment and freq. restoration reserves. Kanerva Laura & Dey Kaustav (19.4.)**
27. **Prosumer / Consumers. Local energy resources and local energy matching. Pesonen Emma & Kössi Pihla (5.4.)**
28. **Different market mechanisms for SG: bidding, real-time pricing, block chains. Tanny Nusrat & Niloufer Zarei (5.4.)**
29. Technical solutions in Micro Grids.
30. **Power and Energy Balance management in Micro Grids. Salas Salazar Manuel**
31. **Interconnection of Micro Grids with each other / power system. Helin Aleksi**
32. Demand response in power system energy balance management.
33. Demand response in distribution grid congestion management.
34. **PV hosting capacity of low voltage and medium voltage grids. Matti Lehtonen**
35. **Active voltage control in SG. Sorjamäki Joonas & Simonen Miina-Maija**
36. Monitoring and control in SG. SCADA and NIS systems.
37. Network impacts of distributed generation. Voltages and relay protection
38. Power Quality issues in SG.
39. Wind farms, their local grids and connection to the power system.
40. Solar farms, their local grids and connection to the power system.
41. **Supergrids. Perttula Tomi & Malmberg Jonne (22.3.)**
42. **Future street lights. Montero de la Plaza Jaime**
43. Smart Meters and their Security Issues.
44. Smart Grids and electrical safety.
45. **Concentrating solar power and its comparison to photovoltaics. Kallio Suvi & Nortamo Nick**
46. **Sector coupling of power and heat. Majamaa Noora & Hytti Valtteri (29.3.)**
47. **Deep heat energy wells for ground source heat pump systems. Vähä-Koukkula Jesse & Hyvönen Iiro (15.3.)**
48. **Electrical buses and their charging solutions. Lavonen Lauri & Autio Eero (5.4.)**
49. **Electrical trucks and their charging solutions. Kondakov Julia & Mattheiszen Matias (19.4.)**
50. **Energy communities. Rallis Maximilian & Pucciarini Alessia**