

Course Structure

Course Code : SM7301

Course Title : Autonomous Smart Systems

Credit Hours : 3

Course Description

- Definition and types of autonomous smart systems, Assessment of Autonomous System feasibility , Decision making, Implementation of Autonomous Energy Systems, Autonomous Energy Systems for collective consumers, Autonomous Energy Systems for individual consumers, Design of Autonomous Energy micro-grid system, Home energy systems, Energy safety for end consumers.

Course Objectives

- This course aims to serve the candidates by introducing fundamentals of smart energy systems elements, design and assessment.

Course Topics

- Introduction: Definitions of Autonomous Energy Systems
- Comparison between Dispersed Energy Systems and conventional ones
- Types of Autonomous Energy Systems Resources: Conventional
Renewable
Hybrid
- Initial Phase of Autonomous Energy System creation: Conditions required for Autonomous Energy System creation
Determination of needs
Determination of resources
Determination of potentials
- Assessment of Autonomous System feasibility
Overview
Statistical data collection
- Assessment indicators
Self-sufficiency in heat
Self-sufficiency in electricity
Self-sufficiency in fuels
- Decision making (vs. partially autonomous regions)
100% autonomous regions
Partially autonomous regions
No autonomous regions
- Implementation of Autonomous Energy Systems
Considerations of Autonomous Energy System implementation
- Autonomous Energy Systems for collective consumers
Assessment of annual needs, actual and potential production
Feasibility of collective consumers autonomous system creation.
- Autonomous Energy Systems for individual consumers
Estimation of the individual self-sufficiency in heat, electricity and fuels.

M.Sc. in Smart Control Systems for Energy Management

Course Structure

- Feasibility of individual consumer autonomous system creation.
- Estimation of external energy supplies if needed.
- Design of Autonomous Energy micro-grid system
 - Elements of energy micro-grid system
- Elements of energy micro-grid system
 - Distributed generation
 - Grid energy storage
 - Switches and power electronics
- Home energy systems
 - Micro-turbines
 - Energy storage
 - Fuel cells
- Energy safety for end consumers
 - Factors affecting end consumer energy safety
 - Model of energy safety improvement
- Case studies from Germany and Czech republic.
- Case studies from Poland and Slovenia

References

- E. W. Ter Horst, K. Blok, E. A. Alsema, W. C. Turkenburg, Optimization of Hybrid Autonomous Energy Systems, Seventh E.C. Photovoltaic Solar Energy Conference, pp 257-262