

Tárgytematika / Course Description

Controlled storage devices

AJNM_BMTA026

Tárgyfelelős neve /

Teacher's name: dr. Tóth-Nagy Csaba

Félév / Semester: 2021/22/1

Beszámolási forma /

Assesment: Vizsga

Tárgy heti óraszám /

Teaching hours(week): 2/1/0

Tárgy féléves óraszám /

Teaching hours(sem.): 0/0/0

OKTATÁS CÉLJA / AIM OF THE COURSE

The goal of the course is to provide a comprehensive overview on the state-of-the-art energy storage technology with a view on system approach including modelling and control the storage units. Quantitative relationships and mathematical models are also described so that the students are able to solve numerical problems. A particular attention is paid to up-to-date controlled storage problems of Electric Vehicles. A further relevant goal is to look into the future, so promising development trends are also presented.

TANTÁRGY TARTALMA / DESCRIPTION

Topics of lectures:

1. week: Driving forces of distributed energy generation and energy storage. Centralized and distributed energy generation.
2. week: Needs and requirements with respect to energy storage. Principles and devices of electrical energy storage.
3. week: Parameters and characteristics of electrical energy storage devices and systems. Energy storage state-of-the-art.
4. week: Large scale energy storage. Role of hydrogen energy storage.
5. week: Properties and characteristics of flywheel systems.
6. week: Properties and characteristics of electrochemical energy storage systems.
7. week: Fundamentals of lithium batteries.
8. week: Challenges , requirements of electrical vehicles regarding electrical energy storage. Aspects of device/system selection.
9. week: SoH and Lifetime of batteries.
10. week: Battery modelling.
11. week: Fundamentals of design of storage device systems, control of storage systems.
12. week: Prospects and future trends of electrical energy systems.
13. week: Test
14. week: Project work presentation

SZÁMONKÉRÉSI ÉS ÉRTÉKELÉSI RENDSZERE / ASSESMENT'S METHOD

During the semester the obligation is to pass one test and present a project work. The test is scheduled for the

13th week and the presentation for the 14th week. The test contains of two theoretical questions and one example of maximum 10 points per each. Pass level is minimum 12 points. The final mark is composed as follows: 75% for the written/oral exam and 25% for the midterm test.

KÖTELEZŐ IRODALOM / OBLIGATORY MATERIAL

Kötelező irodalom/Obligatory:

- Lecture notes

Selected bibliography:

- Akhil Abbas A, Huff Georgianne, Currier Aileen B, Kaun Benjamin C, Rastler Dan M, Chen Stella
- Bingqing, et al., DOE/EPRI Electricity Storage Handbook in Collaboration with NRECA, Sandia National Laboratories, Albuquerque (2015)