Module Name	Controlled Energy Systems
Module Number	EuI-ET-E-GerES, EuI-RES-E-GerES
Responsible Lecturer	Prof. Dr.-Ing. Matthias Centner matthias.centner@tu-dresden.de
Qualification Objectives	After completing the module, students have acquired knowledge about the structure and operational behavior of electrical energy converters in power generation systems and an understanding of the dynamic processes in electrical machines and networks. They are able to apply this knowledge to the design and optimization of controlled energy systems.
Contents	The module covers Controlled Energy Systems with a focus on: - Energy and power concepts - Synchronous generators - Grid and island operation - Asynchronous generators - Example control systems such as steam power plants, hydropower plants, wind power plants, pumped storage plants - Flywheel storage - Grid control - Power flow controllers - High-voltage direct current (HVDC) transmission Additionally, the module addresses Electromechanical Dynamics with a focus on: - Dynamic behavior of orthogonal or coupled winding systems in DC drives or transformers - Space vector models, transfer behavior, and dynamic operating states of rotating field machines - Harmonic analysis, zero-sequence components - Wave phenomena and stress analysis
Teaching and Learning Forms	4 hours per week of lectures, 1 hour per week of exercises, 1 hour per week of practical lab courses, 4 project days (5 hours each) as block courses, and self-study.
Prerequisites for Participation	The competencies to be acquired in the module "Electrical Machines" in the diploma program Electrical Engineering, as well as the competencies from the first semester of the module "Power Electronics" in the diploma program Electrical Engineering or the diploma program Renewable Energy Systems, are required.
Usability	The module is an elective module in the elective area "Competence Deepening" according to § 6 (3) SO and § 33 (4) PO of the main study program in the field of Electrical Power Engineering in the diploma program Electrical Engineering. Furthermore, it is an elective module in the elective area "Competence Deepening" according to § 6 (3) SO and § 33 (3) PO of the main study program in the diploma program Renewable Energy Systems. It creates the prerequisites for the modules that list this module in the field "Prerequisites for Participation."
Prerequisites for the Award of Credit Points	Credit points are awarded when the module examination is passed. The module examination consists of a non-public oral examination as an individual examination lasting 45 minutes and a complex assignment with a workload of 30 hours.
Credit Points and Grades	7 credit points can be earned through the module. The module grade is determined by the weighted average of the grades of the examination components. The oral examination is weighted sevenfold, and the complex assignment is weighted threefold.
Frequency of the Module	The module is offered every winter semester.
Workload	The total workload is 210 hours.

Duration of the Module	The module lasts one semester.