



Name of the course:

Course type:

Responsible lecturer:

Content:

Power Electronics

Optional

Dr. Péter Korondi

From a practical approach, students get to know the two-gate monolithic bidirectional switches (M-BDSs) featuring bipolar voltage blocking and bidirectional current control capability, the subject starts with highlighting the advantages of M-BDSs for the realization of ultra-compact non-isolated and isolated three-phase PFC rectifier systems and next-generation inverter systems with low motor insulation stress. Next, the performance gains achievable with three-level T-type VSC (voltage source converter) topologies, new single-stage isolated AC/DC converter structures, and the unique features of current-source converter approaches—today solely employed in thyristor-based high-power medium-voltage motor drives— and AC/AC matrix converter concepts over state-of-the-art VSC systems are emphasized. All this identifies M-BDSs as one of the main drivers of a 4th wave of disruptive performance improvements of power electronic converter systems. The subject will conclude with remarks on the urgency of a transition from a linear economy to a circular economy, which also needs to be considered for future power electronic converter designs. Building on the understanding and knowledge gained by brilliant engineers over the last decades, i.e., standing on the shoulders of giants, power electronics research must now target “beyond tomorrow” improvements, and enable a circular-economy-compatible Power Electronics 5.0 to ensure that the 2050 net-zero-CO2 target is reached on a sustainable basis.

Literature:

- Lin Luo Fang: Power Electronics: Advanced Conversion Technologies, ISBN: 9780367656157, 2020