At the heart of modern power electronics converters are power semiconductor devices. The emergence of wide bandgap (WBG) semiconductors, including silicon carbide (SiC) and gallium nitride (GaN), promises power electronics converters with higher efficiency, smaller size, lighter weight, and lower cost than converters using the established silicon-based devices. However, WBG devices pose new challenges for converter design and require more careful characterization, in particular due to their fast switching speed and smaller die size. This seminar presents comprehensive methods with examples for the characterization of GaN and SiC power devices, including static, dynamic, and thermal characteristics. The seminar will have a strong focus on application-oriented device characterization, for the purposes of optimizing a WBG-based converter design. Topics will include challenges particular to GaN and SiC-based converter design, such as cross-talk, dynamic on-resistance, and parasitic effects of practical loads and different topologies. The presentation will conclude by demonstrating how a detailed device characterization can be applied to improve a converter design. The intended audience includes university professors and graduate students, practicing industry engineers, and other researchers working on WBG-based power electronics. Content will range from intermediate to advanced, and requires only a basic knowledge of device characteristics and converter design.