This course will cover the primary process flow of the electrical design of electron guns. Process flow includes starting from the gun performance goals and constraints, to knowing when to use simple analytical models for scoping basic parameters, and finally to modeling and simulation, which is a process in its own right. The course concentrates on approaches to Pierce-type diode design for instruction purposes, but will discuss the primary issues regarding MIG guns, field emission tips and arrays, and photoemission.

Modeling and simulation will cover the different approaches and aspects the designer faces starting from the scoping phase to the final high-fidelity simulations for design performance verification. Other aspects, as time permits, will be introducing approaches and techniques used for design sensitivity analysis, which can be done in several ways from standard optimization tool and parameter sweeps to the use of adjoint methods.