Applied Physics – Electronic Devices and Materials (AP-EDM)

Students who are taking the MS Written Comprehensive Exam with major in Applied Physics - Electronic Devices and Materials should have taken the core sequence of ECE230ABC. One graduate-level exam question on the ECE MS Exam will be based on the material taught in ECE230A/230B.

The required materials for the Written Comprehensive Exam are the class lectures, notes, and assigned books for the courses. The topics can be found from the following textbooks,

- Robert F. Pierret, “Semiconductor Fundamentals” (Vol 1), Modular series on solid state devices, Addison-Wesley (1989) and

The topics that will be tested may include the physics of solid-state electronic materials and devices. Specific topics will include

1. Crystal structure of solids, quantum theory and energy band, Bloch theory, effective mass, Fermi level and band diagram,

2. Equilibrium carrier Statistics, carrier generation and recombination, carrier transport, phonons, Poisson’s equation, excess carriers in semiconductors,

3. PN Junction

4. MOS devices, MOSFETs, CMOS performance factors,

5. Bipolar transistors and SiGe bipolar devices.

6. Principles of CMOS and bipolar scaling to nanometer dimensions and their high frequency performance in digital and analog circuits.