

Keywords and suggested reading for written exams for Master's Course, Quantum Matter Program (Electronic Engineering Field), Graduate School of Advanced Science and Engineering (October 2024 and April 2025 Admission)

1. Electromagnetism

- Basic laws of electricity and magnetism
- Electrostatic fields, conductors, dielectrics, steady currents, magnetostatic fields, magnetic materials, dc circuits, ac circuits, electromagnetic waves
- D. J. Griffiths, *Introduction to Electrodynamics*, 4th edition, Cambridge University Press, 2013, chapters 1 through 9
- P. G. Huray, *Maxwell's Equations*, Wiley, 2010

2. Electric Circuits

- Basics of electric circuits
- dc circuits, ac circuits, network analysis, Fourier transform, 2-port networks, transient responses, distributed circuits
- C. K. Alexander and M. N. O. Sadiku, *Fundamentals of Electric Circuits*, 2nd edition, McGraw-Hill, 2003
- R. Collier, *Transmission Lines*, Cambridge University Press, 2013

3. Semiconductor Engineering

- Fundamentals of semiconductor materials and devices
- Crystal structures, reciprocal lattice, Bloch's theorem, energy bands, carrier statistics, diffusion of electrons and holes, carrier generation-recombination, electric conduction, Hall effect, p-n junctions, metal-semiconductor junctions, metal-insulator-semiconductor structures
- S. M. Sze and M.-K. Lee, *Semiconductor Devices: Physics and Technology*, 3rd edition, Wiley, chapters 2, 3, 4, and 6
- S. M. Sze and K. K. Ng, *Physics of Semiconductor Devices*, 3rd edition, Wiley, 2007, chapters 2, 3, 4, and 6

4. Quantum Mechanics

- Basic understanding of quantum mechanics
- Eigenvalue problems and scattering problems
- Wave functions and probability density, physical observables and operators, eigenvalues and expectation values, eigenvalue problems (square-well potential, periodic boundary condition, harmonic oscillator), one-dimensional scattering problem, superposition principle, uncertainty
- A. T. Fromhold, Jr., *Quantum Mechanics for Applied Physics and Engineering*,

Dover, 1991

- L. I. Schiff, *Quantum Mechanics*, 3rd edition, McGraw-Hill, 1968